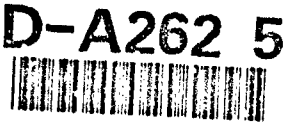

AFIT/GST/ENS/93-09

The Battle of Little Round Top: An Analysis of Battle Alternatives Through Commercial Wargames

THESIS
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THESIS

Presented to the Faculty of the School of Engineering
of the Air Force Institute of Technology
Air University
In Partial Fulfillment of the
Requirements for the Degree of
Master of Science in Operations Research

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March, 1993

THESIS APPROVAL

STUDENT: Capt John J. McGuiness CLASS: GST-93M-09

THESIS TITLE: The Battle of Little Round Top: An Analysis of Battle Alternatives Through Commercial Wargames

DEFENSE DATE: 3 March 1993

COMMITTEE:	NAME/DEPARTMENT	SIGNATURE
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Acknowledgements

I would like to dedicate this thesis to my wife, Gail, for the countless sacrifices she has made on my behalf. Without her continual love and support, none of this would have been possible. I would like to thank the members of my committee, Doctor Joseph P. Cain and Major Edward Negrelli. Doctor Cain's unending thirst for history and Major Negrelli's modeling expertise provided the perfect combination to accomplish this work. Finally, I would like to thank my sponsor at the U.S. Army War College, Colonel Arthur L. Bradshaw. Whether on maneuvers across the German countryside or in an academic setting, he has been an outstanding mentor and most important, a true friend.

John J. McGuiness

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Abstract

This thesis examines the problem of whether one can use commercial wargames as a tool for historical research. The research examines two wargames dealing with the battle of Little Round Top: *Gettysburg: The Turning Point* and *Thunder at the Crossroads*. This research emphasized the need to analyze the wargame's structure prior to playing the game. This will avoid a possible mistake of drawing a conclusion about a particular driver in the battle which may not be from the historical situation but rather an inevitable outcome produced by the model's basic assumptions. Additionally, quantitative measures of timelines, casualty rates, and force ratios were examined during the replay of the historical battle and two other "what if" scenarios. Although some parts of the games are open to debate, for the purpose of exploring the historical battle and playing "what if" type scenarios both served their purpose: to open one's imagination and develop insights. The results of the games must be judged on their insights into the battle, not as a precise prediction of what would happen.

The Battle of Little Round Top: An Analysis of Battle Alternatives Through Commercial Wargames

I. Introduction

1.1 Background

Military officers have traditionally studied historical battles as a key element in their leadership and development. One reason to study history is to gain insights into the problems and issues confronting past combat leaders. Issues such as command and control, the proper use of artillery or scouts, and limiting fratricide transcend history. The officers learn from past mistakes and successes to become more effective leaders as they take on positions of increased responsibility.

The two most common methods to learn about the battles are through readings and terrain walks. The U.S. Army uses both extensively and often uses one to enhance the other. Readings and terrain walks have many advantages; however, each has some disadvantages.

Reading about historical battles is the easiest and most available method. Officer required reading lists, Army school curricula, and field manuals contain historical examples to illustrate military principles. However, one problem with reading historical accounts of battles is that the reader is subject to the author's view of the action. Sometimes this view can be a biased one or a distilled version that leaves out many important points.

Conducting terrain walks is another method of learning about historical battles. During a terrain walk a person is normally part of a group with a facilitator who is

able to point out and explain the significant events. A terrain walk allows a person to take a more active role in the learning process. One advantage of terrain walks is that a person can walk the ground and place himself in the positions of the soldiers who fought there. A person can then draw his own conclusions as to why the events occurred as they did and use his own experience to draw insights of the battle. The terrain walk is an excellent technique to open one's imagination and explore different possibilities.

The U.S. Army War College, located at Carlisle Barracks, Pennsylvania, uses terrain walks as part of the curriculum. The purpose of the War College is "to educate senior officers and civilian officials to serve in positions of significant responsibility in times of both peace and war and to promote understanding of the art and science of joint warfare" (3:ii)(1991). Officers attending the War College perform a battle analysis of the battle of Gettysburg and then conduct a terrain walk of the battlefield to gain insights into the problems and issues confronting the leaders of the battle.

While terrain walks of the battlefields surface many valuable issues into the lessons of history, not everyone can have the opportunity to participate in them. Another possible method one can use to study history is through wargames. According to Dr. Peter Perla, wargames can re-create the constraints of knowledge and capability under which historical commanders had to operate to allow players a fresh perspective on why events took place as they did. He feels wargames help "... to offset the distortion and intellectual arrogance that too often accompany 20–20 hindsight" (28:181)(1990). The interactive nature of wargames allow players to take a more active role in the learning process. Players can not only devise new courses of action, like during terrain walks, but can replay them to determine an outcome.

The Department of Defense defines a wargame as a simulated military operation involving two or more opposing forces using rules, data and procedures to depict an actual or assumed real life situation (22:393)(1989). Leaders have used wargames

to teach military concepts throughout history. The use of wargames as a training tool use can be traced from the times of Sun Tzu through the Germans in the 1930's to today.

Despite the uncertainty about the origins of wargaming, many people credit the invention of the first wargame to Sun Tsu, the Chinese general and military philosopher whose classic, *Art of War*, has influenced readers throughout the centuries. Sun Tzu introduced a game known as *Wei Ha* (meaning encirclement) over twenty-five hundred years ago. The players of *Wei Ha* maneuvered colored stones, representing their armies, on a specially designed playing surface. In keeping with Sun Tzu's philosophy of resorting to battle only as a last resort, victory went not to the player who could bludgeon his opponent head-on, but to the first player who could outflank his enemy (28:16). The ability to outflank one's opponent is still a valuable tactic today. For example, the allied coalition used this technique to destroy the Iraqi Army during the Gulf War.

The German Army's greatest achievement in wargaming took place during the interwar years of the 1920's and 1930's. During this time the Germans depended on the wargame to take the place of field maneuvers denied to them by the Versailles Treaty (21:21) (1952). The wargames proved to be a valuable training tool for their officer corps and an excellent method to develop the doctrine and tactics used successfully during World War II. The following account of a 1940 action by General Heinz Guderian, then commanding the XIX Corps as it crossed the Meuse against the British and French on 10 May is an example:

> In view of the very short time at our disposal, we were forced to take orders used in the war games at Koblenz from our files and, after changing the dates and times, issued these as the orders for the attack. They were perfectly fitted to the reality of the situation...The divisions [then] issued orders to their unit commanders which began: "Attack in accordance with map exercise carried out on ... (17:101) (1952)"

The emphasis of using wargames as part of an officer's training and development continues today. For example, the U.S. Army War College uses wargames "to educate, explore alternatives, provide insights, practice decision making under a variety of simulations, surface issues and generate discussion" (3:16). Because wargames emphasize human interaction and role-playing, wargaming can be a valuable learning tool. Students can experiment in a simulated environment and observe the results. Moreover, the wargames enable each student to make decisions and learn from his mistakes without having to suffer the consequences of poor decisions and wasting valuable resources.

Professional military men have traditionally developed wargames; however, this is changing. One significant change in wargaming since World War II is the growth of commercially produced wargames. Charles Roberts published the first modern commercial wargame in 1953 called *Tactics* (28:114). A tremendous expansion of the industry has occurred since then. Commercial wargames have introduced many people to the study of military history through gaming. Many wargames pay an overwhelming attention to historic details and in many instances pattern themselves after historic campaigns. This aspect of wargames can make them particularly valuable to military officers. Recreating historical battles provides players a perspective into why events took place as they did and helps illuminate the drivers of particular situations.

Although one can gain many valuable insights playing wargames, there can be some danger in drawing a conclusion based solely on their results. As Doctor Peter Perla states in his book, *The Art of Wargaming*, "It [wargame analysis] is not a technique for producing a rigorous, quantitative or logical dissection of a problem or for defining precise measures of effectiveness"(28:27). The game's outcomes are determined through stochastic processes and the chances of two battle outcomes being exactly alike are infintesimal. A person cannot assume a particular battle outcome based on one game result. Another problem with the play of wargames is that

it would be impossible to duplicate the strain under which the actual commanders made their decisions. A wargame cannot duplicate the feeling of being in combat and seeing soldiers die. A third problem with recreating battles through wargames is a poorly designed game may not recreate the battle as it happened but reflect the bias of the game's designer. A conclusion drawn from a particular battle outcome may not be from any particular driver but an inevitable outcome based on the game's design.

1.2 Purpose

The purpose of this thesis is to assist history instructors at the U.S. Army War College in analyzing the historic battle of Little Round Top. The battle will be re-created using two commercial wargames as vehicles to explore tactical alternatives and develop insights for further education and debate. I will use the wargames, *Thunder at the Crossroads* (a board game) and *Gettysburg: The Turning Point* (a computer game).

The following analysis will not define a best course of action or derive a "typical" or "likely" result. The battle is part of our history. The result may not have been typical. If history teaches us anything, it reminds us that in war the unexpected is commonplace. If the battle was refought, the results may be completely different. Consequently, the use of the wargames is to find the insights and the drivers to the battle and help explain why the decisions occurred as they did.

1.3 Problem

According to Dr. Perla, much of the emphasis in the formal analysis of commercial game play is on improving the player's ability to win (28:262). However, little attention is given to the investigation of whether these games can be used as a tool for research into historical military operations. This thesis will address the

problem of whether one can use commercial wargames as a serious tool for historical research.

The three specific research objectives are:

- To compare the historical combat outcome of the battle of Little Round Top with the results obtained from two commercial wargames
- To determine what changes are required in the model to make it more representative of the historical combat
- To determine the sensitivity of the combat outcome to changing the scenarios based on possible force ratios and sequence of events, given a good relationship between the models and the actual battle

1.4 Scope

Through conversations with my sponsor at the War College, the scope of the problem was quickly narrowed to events during the battle of Little Round Top. From that point two decisions had to be made; first, what scenarios to play and second, what wargames to use.

The first step was to choose the scenarios. The scenario sets the stage for the game by placing the players in specific situations and giving them a context for their decision making (28:165). The three scenarios I will use are:

- Recreating the battle of Little Round Top
- "What if" Law's brigade attacks Chamberlain from the flank
- "What if" Benning's brigade follows Law's brigade and attacks Chamberlain from the Flank

I chose recreating the battle to determine how well each model replicated the events. The model does not have to precisely duplicate the actual events to be of

any value. I would not expect it to. I would expect the flow to be roughly the same and the importance is the insights revealed by the game.

I chose the last two scenarios after careful consideration of possible courses of action. It was important not to develop a preposterous course of action but one that could have or was planned to have happened but did not due to the "fog of war".

Once I selected the scenarios, I then began the process of choosing the wargames. Over a dozen commercial wargames dealing solely with the battle of Gettysburg are on the market. From these, half are out of print or sold only in collectors markets. The potential list was cut further due to previous research conducted by Jude Fernan on the training value of commercial wargames. His research looked at three games; however, two were too aggregated for this effort. I narrowed my focus down to two games: *Thunder at the Crossroads* and *Gettysburg: The Turning Point* because both games are capable of representing brigade level units and lower.

1.5 Overview of Document

The intent of this chapter is to provide a general overview of the background and problem. Chapter II is a literature review that summarizes pertinent information about the battle of Little Round Top and the combat modeling process. Chapter III discusses the approach to the problem including the methodology and data collection procedures. In Chapter IV, I will provide the historical background of the events that occurred during the battle of Little Round Top. Chapter V provides a detailed discussion of the board game, *Thunder at the Crossroads* along with the results of the scenario play, while Chapter VI accomplishes the same for the computer game, *Gettysburg: The Turning Point.* Finally, Chapter VII concludes the thesis and presents recommendations for further study.

II. Literature Review

2.1 Introduction

The purpose of this literature review is to acquaint the reader with developmental and informative literature on the battle of Little Round Top and commercial wargames. Learning about the battle of Little Round Top consisted of gaining a thorough understanding of the events during the battle and the tactics, arms, and equipment of the time period. Learning about commercial wargames required a thorough knowledge of their historical basis, design, and game play. The following paragraphs capsulize the state of the art pertinent to each of these areas.

2.2 Historical Literature

The literature review to obtain the background knowledge of the battle of Little Round Top fell into four categories. The areas started very general in nature and ultimately addressed very specific points. The categories include: the battle of Gettysburg, the battle of Little Round Top, the equipment and tactics, and a battlefield visit.

2.2.1 The Battle of Gettysburg. The first step in the research process was to gain a thorough understanding of the battle of Gettysburg. The battle is perhaps one of the most examined events of our nation's history. With over 50,000 books in print and many periodicals routinely published on the Civil War, finding resources on the battle is not a problem (25:IX),(1988). However, the trick is to choose resources that provide a good overall description of the battle from a non-biased viewpoint.

Gettysburg, The Final Fury,(1974), by Pulitzer Prize winning author Bruce Catton, provides an excellent overview of the Gettysburg Campaign. Mr. Catton is widely recognized as an authority on the Civil War and has written eleven other books about the war. In *Gettysburg, The Final Fury*, he narrates the course of events

and examines the military and political consequences of the campaign. He pays particular attention to describing the human tragedies and includes many photographs, drawings and paintings that bring the battle to life. This book provides an excellent foundation for anyone interested in gaining an overall view of the campaign. The only problem is that his description of the battle is a little too generic for anyone needing to analyze each days events. One needs to know the specifics of the battle to gain a full appreciation of the events and use this knowledge to adequately compare the wargames available.

One of the most comprehensive works on the battle of Gettysburg is *The Gettysburg Campaign: A Study in Command*,(1984), by Edwin B. Coddington. The book meticulously describes the events and preparations leading up to General Lee's invasion of the north, the battle itself, and the subsequent withdrawal of forces south. Coddington provides a balanced examination of the battle with extensive use of letters and excerpts from the official records to describe the events. The book also provides a thorough examination into the thoughts of the commanders, the organization of the two armies and the type and employment of the weapons. *The Gettysburg Campaign: A Study in Command* became an invaluable reference throughout the research effort.

A third excellent source of information to the battle of Gettysburg is *The Gettysburg Magazine*. As the name implies, the magazine publishes articles solely on the battle of Gettysburg. The bi-annual magazine proved to be an outstanding source of information. The articles range from broad subjects concerning the battle to very specific in nature. Articles such as: *Time on Little Round Top*, by James R. Wright (32) and *Through Blood and Fire at Gettysburg* by General Joshua Chamberlain (4) are a few of the articles that focused on the events of 2 July, 1863. These articles provided an excellent framework to use during the play of the wargames.

2.2.2 The Battle of Little Round Top. With a clear picture of the battle of Gettysburg, the research shifted to a thorough understanding of the battle of Little Round Top. The most complete reference that I found was *The Attack and Defense of Little Round Top*,(1913), by Oliver Norton. The strength of this book is in its thoroughness in examining the battle. Norton participated in the battle as color bearer for Colonel Strong Vincent. He also had the opportunity to interview and correspond with many other soldiers who fought in the battle that day. Although at times Norton can be accused of being a little bias, he devotes large sections of the book to excerpts from other prominent historians, the official records, descriptions of the units, and short biographies on key figures.

The second excellent source of information on the battle of Little Round Top is entitled, *Gettysburg - The Second Day*,(1987) by Harry W. Pfanz. Unlike Norton's book that concentrates solely on the events on Little Round Top, this book discusses the events on the entire battlefield in great depth. Pfanz's thorough account of the Confederate assaults at Devil's Den and Little Round Top are outstanding. Mr. Pfanz spent a ten year assignment at the Gettysburg National Park as its historian. He has an unparalleled mastery of the vast amount of literature about the battle as well as the ground on which the fighting occurred. He brings out his wealth of experience of the battle in the book. The book also contains outstanding maps of the battle down to regimental level. These were some of the best maps that I found in any book of the battle. Chapter 4 includes several of the maps to enhance the description of the battle.

2.2.3 Arms, Equipment and Tactics. A very good reference on the arms, equipment and tactics of the Civil War is *Arms and Equipment of the Civil War*,(1962) by Jack Coggins. Learning about the weapons and equipment available to the soldiers had several benefits. First, it helped explain the tactics and organization. Second, it provided the basis to evaluate how each wargame modeled the tactics and the different effects of weapons.

Another strength of *Arms and Equipment of the Civil War* was its numerous illustrations. The illustrations included examples of organizations, battle formations, equipment, and comparative tables of various artillery, infantry, and calvary weapons. Also of help were examples of time lines showing the weapons and types of ammunition used by a defender as an attacker approached his position. As Mr. Coggins states in his preface, this book is not about the when, where, and why of the war, but rather the *how* and *with what* (6:6).

One of the most data comprehensive books on the battle of Gettysburg is *Regimental Strengths and Losses at Gettysburg*,(1986), by John Busey and David Martin. Their work initially started out as two separate research projects. Busey was conducting research of Confederate losses while Martin the North's. Kathy George Harrison of the Gettysburg National Military Park introduced the two and they combined their work to produce the book (2:VII). The value of the book lies in its vast amount of data. The book lists all regimental strengths, losses, and comparative figures, along with similar information for artillery and cavalry units. The book also contains information on the predominate weapons used in each unit. For continuity, all strength and loss figures were taken from the book (Tables 3.3 – 3.7).

2.2.4 Terrain Walk. No book or reference provided a greater understanding of the events than conducting a terrain walk of the battlefield. The terrain walk created a vivid impression of what the soldiers saw and how the different parts of the battlefield pieced together. The terrain walk also aided my understanding of the readings. As each author discussed his particular subject, I was able to remember the actual area he was talking about. The visit enabled me to take a more critical look at the wargames and how each modeled the terrain and movement. The terrain walk was one of the most important elements to the research of the battle.

One of the references I used during my own battlefield terrain walk was *The U.S. Army War College Guide to the Battle of Gettysburg*,(1987), by Doctor Jay Luvaas and Colonel Harold Nelson. As the authors are quick to point out, the book is not another history of the battle of Gettysburg (24:IX). Unlike most history books that provide the historian's view of the battle, the book's format encourages the reader to become his own historian. The book maps out an ordered course consisting of 25 stops. For each stop, the book contains numerous maps, diagrams, and excerpts from the official records of the leaders that were involved in the battle. This allowed a person to draw his own conclusions on what happened and why versus reading a historians point of view. The stops are arranged so that one can get a sense for how the battle evolved over the course of the three days. Although the study of the battle of Little Round Top became an ongoing process, the resources listed above provided a solid foundation for the research.

2.3 Combat Modeling

This section of the literature review will address those references used to gain a thorough understanding of the combat modeling process and of commercial wargames. The works of four individuals: Colonel Trevor Dupuy, Dr. James Hartman, James Dunnigan, and Dr. Peter Perla provided an excellent transition from history to the world of combat modeling and commercial wargames.

2.3.1 Linking History to Modeling. Colonel(Ret) Trevor Dupuy is considered one of the leading military historians in the world today. He is the author or co-author of over 80 published books and articles. Colonel Dupuy has spent a lifetime devoted to historical research. After retiring from the Army, Colonel Dupuy founded the Historical Expert Research Organization (HERO). The group is dedicated to promoting the cause of historical analysis by applying the lessons of history to current military problems.

Colonel Dupuy's group conducted a study for the U.S. Army's Concept and Analysis Agency to develop a list of critical measures of effectiveness with which to evaluate battles. The group analyzed over 600 battles including the battle of Gettysburg to construct a data base to support combat models. The data base developed parameters for force ratios, terrain, weather, and weapons characteristics as well as other factors that affected the battles. In a later article entitled *Can We Rely on Computer Simulations*, (1987), Colonel Dupuy challenged the use of Department of Defense computer simulations that were not grounded in the historical accuracy provided by his research.

2.3.2 Combat Modeling. The combat modeling courses, Land Combat Modeling I and II presented as part of the curriculum at the Air Force Institute of Technology provided a thorough understanding of the combat modeling process. The classes exposed students to a tremendous array of literature on the art of combat modeling. Of particular importance to this research were the discussions of identifying the purpose of the model, its underlying assumptions, drivers (those things if changed, will change the results), and the need to conduct sensitivity analysis on the drivers. The course provided the essentials to conduct this research. Although several of the readings illustrated the modeling process, the work of Dr. James Hartman stands out.

Dr. Hartman discusses the "how to" of modeling in his lecture notes on high resolution and aggregate combat modeling. He presents the mathematics behind the models and poses several questions to address while evaluating combat models. For example, some of the areas of concern are how the game models the battlefield, movement, and attrition processes. These questions assisted in the examination of the wargames.

2.3.3 Commercial Wargames. James Dunnigan is an expert in the field of the design and play of wargames. Dunnigan is the author of over 100 wargames and

300 published articles and books. As an experienced and respected member of the gaming community, Dunnigan believes in the need for realism in wargames based on the study of history. In the book, *The Complete Wargames Handbook*, (1980), Dunnigan provides information concerning all facets of the wargaming arena. He includes a process for examining and playing wargames. Of particular help is his discussion on how to construct and analyze games. Within the book he develops a wargame step–by–step to illustrate his points so the reader can get a clear understanding of the methodology. The book also includes a section of some of the commercial wargames on the market along with a brief commentary on each.

One of the leading experts on wargaming in the Navy is Doctor Peter Perla. In his book, *The Art of Wargaming*,(1980), Doctor Perla examines the history of wargames. their essential principles, and their impact for the future. Dr. Perla provides insightful comments on what wargames can and cannot be used for.

According to Dr. Perla, wargames are important tools because they help investigate the art of warfare, train officers, and provide incentive for players to examine the underlying themes of the model's subject matter (28:6,9). The examination of the principles and themes of warfare improves the understanding of the officers involved and increases the chances that in times of conflict, they will react in accordance to the lessons learned from them. Perla provides examples of how the U.S. Navy uses commercial wargames to train officers.

Dr. Perla believes that wargaming "is most productive when used as an organizing and exploratory tool or as an explanatory device" (28:180). First, as an organizing tool, the wargames help designers and participants to tie their thoughts together and provide them a more operational focus. Second, as an exploratory tool, the wargames provide players new insights, which often lead to further investigation into the validity and source of their beliefs. Third, as an explanatory tool, wargames can effectively communicate historical, operational, and analytical insights to the users (28:180-181).

According to Dr. Perla, current reviews of commercial wargames concentrate more on, "how to play better," than on the analysis of the games and on deriving insights into the battles the games are supposed to represent. Dr. Perla states there is a need to push such informal analysis of hobby games in the direction of becoming a serious tool for historical or contemporary military affairs (28:262). The goal is to evaluate how well the games recreate the historical environment of the events or situations they are attempting to portray.

2.4 Summary

Despite the growing use of commercial wargames, there exists a need to address the question of if these games provide a useful tool for historical research. The use of the battle of Little Round Top as an educational experience for officers at the U.S. Army War College provides a real world application for the analysis. It is in this area that the research will apply analytical techniques to commercial wargames to assess the model's usefulness as a tool for historical research.

III. Approach to the Problem

3.1 Introduction

This chapter will outline the methods used to determine if commercial wargames can be used as a tool for research into historical battles. The problem requires a thorough understanding of the battle of Little Round Top and the combat modeling process. I broke the problem down into a series of smaller subproblems. Each subproblem was then researched, analyzed, and pieced together. This technique provided a solid foundation for a solution to the more complex problem which was to determine if commercial wargames can provide a technique to analyze historical battlefield courses of action. In the following paragraphs, I will discuss the design of the investigation, data collection procedures, and the analysis methods.

3.2 Design of the Investigation

I will use a seven step process to simplify the organization of the research. The process integrates the two topics: The battle of Little Round Top and commercial wargaming. The seven steps are:

- Learn about the battle of Little Round Top
- Partition the battle into segments
- Learn the wargames
- Play the wargames
- Collect data
- Analyze the wargames' structure
- Analyze the wargames in accordance with the research objectives

3.2.1 Learn About the Battle of Little Round Top. To understand the battle of Little Round Top, one must understand the context in which the battle was fought. For the first six months of 1863, Robert E. Lee and Stonewall Jackson had carried out one of the most extraordinary military campaigns in history. Lee's Army of Northern Virginia smashed huge Federal armies at Fredericksburg and Chancellorsville and won the undying love of the South. But by late May the confederate luck had changed. Stonewall Jackson was dead, the southern economy was in ruin, and 1000 miles to the west, U.S. Grant continued his siege of the rebel stronghold at Vicksburg.

To draw Federal Troops away from Vicksburg, and gather much needed supplies, Lee led his Army into Northern soil looking for the right moment to attack. The battle began on July 1, 1863, in the small farming town of Gettysburg. For the next three days, over 150,000 men would fight in one of the greatest battles ever fought in the western hemisphere.

The battle of Gettysburg began as a clash over shoes. At dawn on July 1st a confederate Infantry officer led his men towards the town of Gettysburg. There was rumored to be a supply of shoes at Gettysburg and the rebels were there to commandeer them. The South came in from the north that day and the North came in from the south (see Figure 3.1). On the outskirts of town the Confederates clashed with the Union soldiers of General John Buford's Cavalry. While both sides sent messengers racing off for reinforcements, Buford fought desperately to hold his ground. The Confederates finally overwhelmed him and pushed the Union forces back through town.

Every Confederate and Union division in the area now converged on Gettysburg. By mid afternoon Confederate troops occupied Gettysburg and the Union troops had been driven back south of the town. There, General Winfield Scott Hancock managed to rally the fleeing troops and established defensive positions on Culp's Hill and Cemetary Ridge.

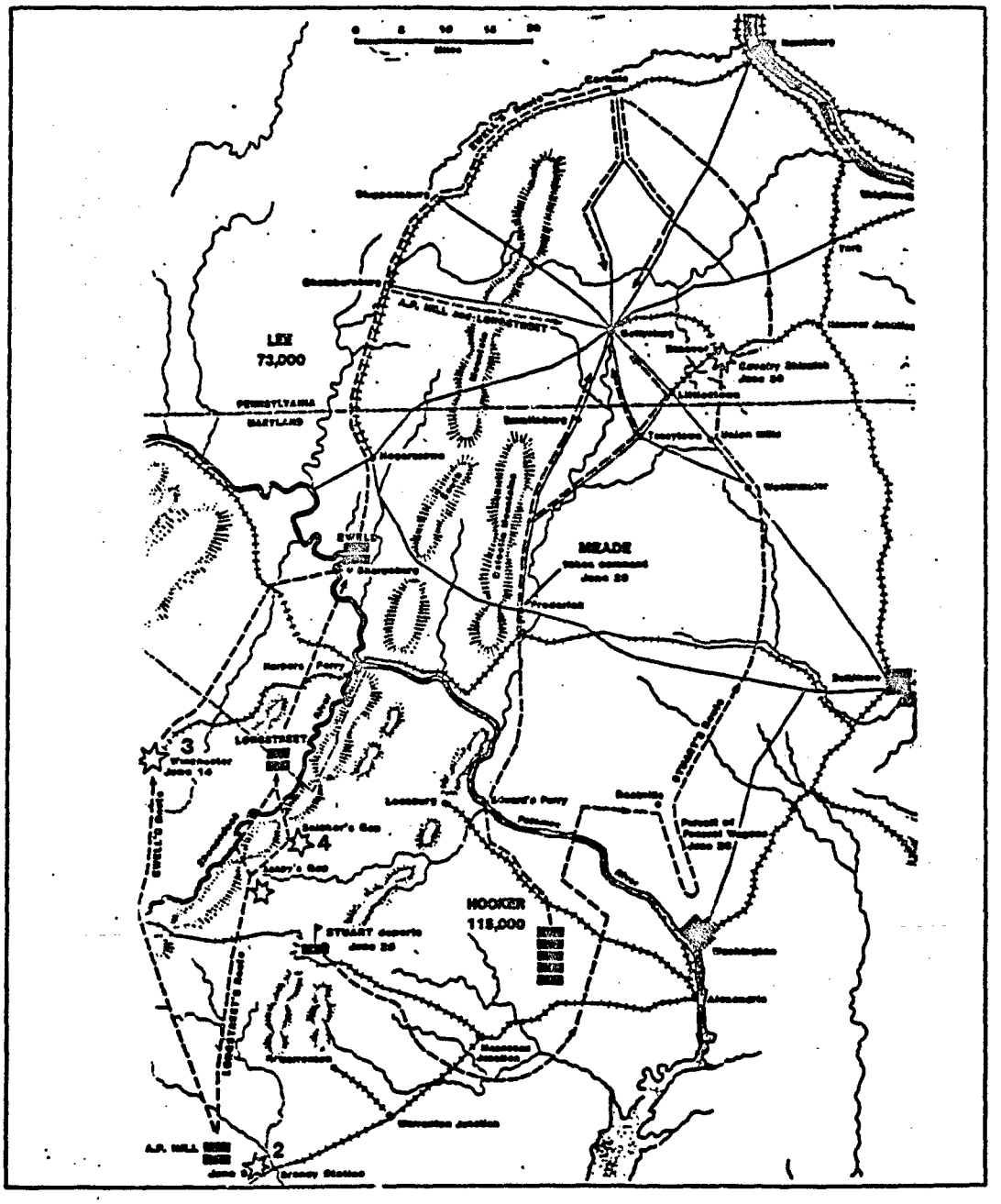


Figure 3.1. Troop Movements to Gettysburg
Reprinted from (30)

General Lee arrived in the middle of the afternoon, set up headquarters and urged General Ewell, his corps commander, to continue the attack before nightfall. Ewell choose not to citing the need for his men to rest. By the end of the day, the Union army had held the highground. Rather than attack the Union head on, the Confederate General Longstreet wanted to flank the Union army and take a stand between Meade's army and Washington and let the Union attack. Without knowing the enemy's strength, Lee overruled Longstreet. Lee told Longstreet, "No, I'm going to whip the enemy here, or their going to whip me" (8:229). Throughout that night, the two armies continued to converge on Gettysburg. By daybreak, on 2 July, 65,000 Confederates faced 85,000 Union troops.

The battle of Gettysburg represented a crucial point in the American Civil War. For this reason, many refer to it as the high water mark for the Confederacy. A Confederate victory would threaten the Union capital, possibly invite international recognition from Europe, and more importantly, provide a catalyst for a negotiated peace with the North (8:225–228). With so much at stake for both sides, it is clear why the battle is considered one of the most significant events of the Civil War.

Different historians will point to one part or another during the battle of Gettysburg and claim that portion of the battle dictated the outcome. Clearly, one of these points would be the battle of Little Round Top. The importance of the battle cannot be understated. The bloody opening engagements on 1 July became a meeting engagement between portions of the two armies. However, by the afternoon of the 2nd, both armies had arrived on the battlefield in force. The battle of Little Round Top represents the first main attack on the Union line on 2 July. General Lee decided to execute the main attack of the Confederates against the left of the Union line in an effort to roll their flank. If the attack was successful General Lee could:

- Capture the Union supply trains
- Cut General Meade's lines of communication with Washington

- Force General Meade to leave his strong position and attack the Confederates in the open
- Threaten Washington or Philadelphia

The events that followed dictated the actions for the rest of the battle. The approach to becoming an expert on the battle involved research of a general nature into the battle of Gettysburg and then narrowing the focus to a more specific analysis of the battle of Little Round Top, arms and equipment, and tactics.

The best work on the battle of Gettysburg is *The Gettysburg Campaign: A Study in Command* by Edwin B. Coddington. The book meticulously describes the events and preparations leading up to General Lee's invasion of the north, the battle itself, and the subsequent withdrawal of forces south. Coddington provides a balanced examination of the battle with extensive use of letters and excerpts from the Official Records to describe the events. The book also provides a thorough examination into the thoughts of the commanders, the organization of the two armies and the type and employment of the weapons. *The Gettysburg Campaign: A Study in Command* became an invaluable reference throughout the research effort.

A second excellent source of the battle of Gettysburg is *The Gettysburg Magazine.* As the name implies, the magazine publishes articles solely on the battle of Gettysburg. The bi-annual magazine proved to be an outstanding source of information. The articles range from broad subjects concerning the battle to very specific in nature. Articles such as: *Time on Little Round Top* by James R. Wright (32:51 – 54) and *Through Blood and Fire at Gettysburg* by General Joshua Chamberlain (4:43-57) are a few of the articles that focused on the events of 2 July 1863. These articles provided an excellent framework to use during the play of the wargames.

With a clear picture of the battle of Gettysburg, the research shifted to a thorough understanding of the battle of Little Round Top. The most complete reference that I found was *The Attack and Defense of Little Round Top* by Oliver

Norton. The strength of this book is in its thoroughness in examining the battle. Norton was a participant of the battle as color bearer for Colonel Strong Vincent. Vincent's brigade established the initial defense on Little Round Top. Norton had the opportunity to interview and correspond with many other soldiers who fought in the battle that day. Although at times Norton can be accused of a little bias, he balances his views by dedicating large sections of the book to excerpts from other prominent historians, official records, descriptions of the units, and short biographies on key figures.

No book or reference provided a greater understanding of the events than conducting my own terrain walk of the battlefield. The visit created a vivid impression of what the soldiers saw and how the different parts of the battlefield pieced together. The terrain walk also aided my understanding of the readings. As each author discussed their particular subject I was able to remember the actual area he was talking about. The visit also enabled me to take a more critical look at the wargames and how each modeled the terrain and movement. The terrain walk was one of the most important elements to the research of the battle. Although the study of the battle of Little Round Top became an ongoing process, with the help of the resources listed above, I moved to the second step of the research process.

3.2.2 Partition the Battle into Segments. I divided the battle of Little Round Top into spatial and temporal segments. Partitioning the battle into segments served two purposes. The first was to assist in the understanding of the battle. The second was to have the wargames play smoother. Each wargame requires the movement of forces on a terrain model representing the Gettysburg area. Both games control the events by game turns that represent time intervals. Thus, by knowing where and when units were historically, I could better replay the events as they generally took place.

The battle of Little Round Top is easy to divide spatially. The surrounding terrain features such as the Peach Orchard, Devil's Den, Big Round Top, etc., each had events that would impact on the battle of Little Round Top. The actions and placements of the units that attacked and defended Little Round Top are also very well documented. Therefore, placing units into their respective locations was a matter of culling over the vast amount of historical material.

Although the locations of units are well documented, the timing of the events left much more room for interpretation. The most thorough reference on the timing of the events on Little Round Top is James Wright's article, *Time On Little Round Top.* He did an excellent job of breaking the battle into a succinct time table. This article provided the basis for the following outline. Coddington's *The Gettysburg Campaign: A Study in Command* was the other source that rounded out the information on Tables 3.1 and 3.2.

3.2.3 Learn the Wargames. The third step in the approach to the problem was to learn the wargames. This process consisted of four phases. The four phases are: talking to the designers, learning the tables, reading the rules, and playing small battles.

The first phase consisted of contacting the game's designers to determine their objectives in designing the game and if they had any underlying themes that they wanted players to learn. The insight into the designer's objectives provided a quicker grasp of the game. I looked for how well the designer achieved his goals. For example, Dean Essig, the game designer for *Thunder at The Crossroads* stated his objective to the game was to provide a combat model to support the command system during the Civil War. Mr. Essig wanted to replicate the "ebb and flow" of combat. Specifically, players could not take their units and pound away straight at their opponent. Players had to realize how to rest certain forces, that collecting stragglers and recovery took time, and that the successful commander synchronized his forces at the decisive point

Table 3.1. Event Sequence (2nd Day: July 2, 1863)

Reprinted from (32)

TIME	EVENT
Early AM	1st Div Vth Corps arrives on Cemetery Hill.
3:00	Major General John B. Hood's division arrived at
	a point on the Emmitsburg Road, south of the
	Peach Orchard.
3:00	BG Kershaw, of McLaws' division, on the
	left of Hood's, reported: "About 3 p.m. the head
	of my column came into the open field in front
	of a stone wall, and in view of the enemy."
3:00	Hood's and McLaws' divisions were in place along
	Emmitsburg Road.
3:30	MG Warren arrived at the signal station on the
	crest of Little Round Top.
3:30	Artillery batteries from Hood's and McLaws'
	divisions opened up a cannonade on the line of
	MG Birney's division of Third Corps (between
	Devil's Den and the Wheatfield).
4:00	Longstreet's I Corps moves in echelon to attack
	Sickles' III Corp after artillery preps.
4:00	Vincent detached his brigade and directed it to
	Little Round Top.
4:30	Ward's brigade and Smith's battery hit at Devil's
	Den by the 1st Texas and 3rd Arkansas
	regiments of BG Robertson's brigade followed by
	the brigades of BG's Anderson and Benning.
	Ward's brigade withstood the assault for
	about an hour.
4:45	The center of Vincent's brigade was hit within
	minutes of occupying the defensive position
	on Little Round Top.
5:15/5:30	Ward's brigade was driven back. Confederates were
	able to move up Plum Run.
5:45	Confederates scaled the west face of Little
	Round Top and hit the right of Vincent's brigade.
	Vincent was killed.
	140th NY took position on the right of the line.
	Col Rice assumed command of the brigade.

Table 3.2. Event Sequence (con't) (2nd Day: July 2, 1863)
Reprinted from (32)

TIME	EVENT
6:00	The Confederate attack extends to the left,
	20th Maine is engaged by Oates.
6:15	The left wing of the 20th Maine was refused to
	meet the anticipated flank attack by the 15th
	Alabama.
6:45	Col Chamberlain ordered the bayonet charge,
	wheeling forward and to the right.
7:00	Confederates had been swept from the front and
	fighting had diminished to long range fire.
7:29	The sun dips below South Mountain and dusk begins.
8:00	Detachments were sent out in front of Vincent's
	brigade to gather arms and equipment.
8:25	The area is in total darkness.

on the battlefield (15). It is interesting to note that the objectives established by Mr. Essig were not only very similar to the objectives of Sun Tzu's wargame, *Wei Ha*, developed nearly 2500 years ago, but also similar to the same ideas presented in today's military manuals.

The second phase to learning how to play the wargames was to look at the tables associated with each game. Two of the most important tables of any wargame are the Movement and the Combat Results Tables. The two elements that make up the movement process are the movement allowance of each unit and the terrain effects chart. Factors such as the type and posture of each unit are the basis for its movement allowance. For example, mounted cavalry will have a higher movement allowance than dismounted infantry. The terrain effects chart shows the cost (in movement points) to move on various types of terrain. For example, moving up a forested steep slope costs more movement points than moving along a level road.

With a basic idea of how units move, the next table to analyze is the Combat Results Table. The basic idea behind most combat results tables is that the more combat power you have, the better your chance of success. The combat power of a

unit is usually given in the game, as each engagement occurs the combat power for each unit is added and effects due to terrain are taken into account. Some form of stochastic process occurs, either by a roll of the dice or a random number generation, which indicates where on the tables to find the results of the combat.

The third phase in learning the wargames was to read the rules. The rules provide the basic framework of the game through a logical sequence of events. Memorization of the rules is not necessary because players can refer to them at any time. The two most important reasons to read the rules are to become familiar with how to read and apply the tables and understand what the game has to offer.

The fourth phase of learning the wargames was to play a series of small battles. The purpose of playing small battles such as a brigade versus a brigade, was to ensure I understood the rules and the game play. I used this building block approach until I felt confident playing each game.

3.2.4 Model Execution. Once I understood how to play each game I then began the process of playing three scenarios. The scenario sets the stage for the game by placing the players in specific situations and giving them a context for their decision making (28:165). The three scenarios are:

- Recreating the battle of Little Round Top as it historically occurred
- "What if " Law's brigade attacks Chamberlain from the flank
- "What if" Benning's brigade follows Law's brigade and attacks Chamberlain from the flank

I chose recreating the battle to determine how well each model replicated the events. The model does not have to precisely duplicate the actual events to be of any value. I would not expect it to. I would expect the flow to be roughly the same and the importance is the insights revealed by the game.

I chose the last two scenarios after careful consideration of possible courses of action. It was important not to develop preposterous courses of action but two that could have or were planned to have happened but did not due to the "fog of war". The following paragraphs will describe the three scenarios.

3.2.4.1 Scenario 1: Recreating the Battle of Little Round Top. The development of this scenario is discussed in the beginning portion of this chapter. A complete description of the events during the battle of Little Round Top is in Chapter IV

3.2.4.2 Scenario 2: "What if " Laws' Brigade Attacks Chamberlain from the Flank. This scenario still stirs up controversy over General Longstreet's performance during the battle of Gettysburg. The basis of the controversy is as old as military warfare: how the egos of military commanders influence their decision making. The foundation for the scenario began during the formulation of the attack plan for Day 2. The principle references used to develop the scenario were: *Gettysburg, The Second Day*, by Harry Pfanz, and *Death of a Nation*, by Clifford Dowdey.

While the fighting developed along McPherson's ridge during the first day of the battle, General Longstreet's I Corps marched towards Gettysburg on Chambersburg Road. General Longstreet and his staff rode ahead of his corps. They followed General Lee along the Chambersburg Road and arrived at the vicinity of Seminary ridge about 4:30 (27:32). They arrived in time to see the Union's I Corps falling back to Cemetery Hill, pursued by soldiers from General Ewell's Corps. Generals Lee and Longstreet discussed the enemy, their position, and possible courses of action. Longstreet was the second highest ranking officer in the Army of Northern Virginia and considered, "...It a part of my duty to express my views to the Commanding General. If he approves and adopts them, it is well; if he does not, it is my duty to adopt his views, and to execute his orders as faithfully as if they were my own"

(27:26). Although this statement sounds very professional in nature, the crux of the debate among historians was whether General Longstreet's actions followed his words.

Longstreet did not want to continue the attack at Gettysburg. He wanted to move the Army around the Union's left flank and occupy a strong position between the Army of the Potomac and Washington. The movement would place the Confederates in control of the roads between the Union Army and Washington and Baltimore. Longstreet argued this action would force the Union soldiers out of their defensive positions and fight on ground favorable to the Confederates. If the Army of the Potomac did not react, the Confederates could make a move towards Washington.

General Lee rejected Longstreet's suggestion. Lee stated, "No, the enemy is there, and I am going to attack him there" (27:26). Longstreet continued to attempt to persuade General Lee too change his mind. Lee finally closed the conversation stating, "Gentlemen, we will attack the enemy in the morning as early as practicable" (27:28). Lee then instructed them to make the necessary preparations. Because Longstreet did not attack until 4:00 pm the next day, one common argument among historians was that he was dragging his feet because he did not want to do it.

Lee wanted to initiate the attack with Longstreet's Corps attacking in echelon up the Emmitsburg Road. The intent was to hit the southern flank of the Union, establish Confederate artillery positions on Little Round Top and roll the flank northward toward Cemetery Hill. Lee based his decision on reconnaissance conducted in the morning of July 2 which confirmed the southern portion of the Union line was open. However, by the time Longstreet's corps was in the attack position to the west side of the Emmitsburg Road (about 3:30), General Sickles had moved his Third Corps forward into the Peach Orchard, Wheatfield, and Devil's Den area. The flank was no longer open; instead, Longstreet's corps was face to face with Sickles' corps.

Once General's Hood and McLaws brought their divisions into the attack position, both realized their dangerous situation. The Union southern flank extended

past their own southern flank. When General Lee gave the order at a location over 2 miles away on Seminary Hill, he did not know that under the current disposition of forces an attack in echelon up the Emmitsburg Road would actually expose the Confederate flank to the Union.

General Hood sent scouts to recon the area south of the ridge that, projecting westward from the Devil's Den, marked the end of the Federal line. The scouts reported to Hood the area south of the Round Tops was clear. They also discovered the Union supply trains in the rear and a clear path to take them (5:383). Hood sent a messenger to General Longstreet. Hood felt, "It was unwise to attack up the Emmitsburg Road as ordered." Instead, he pointed out the exposed southern end of the Round Tops and urged Longstreet to allow him, "To turn the Round Top and attack the enemy in the flank and rear" (9:205).

Hood felt confident his suggestion fulfilled the intent of Lee's order. However, Longstreet reply was, "General Lee's orders are to attack up the Emmitsburg Road" (9:205).

Hood and McLaws were surprised by Longstreet's answer. Once again they sent a messenger to Longstreet requesting a change to the order. The messenger returned with the same reply, "General Lee's orders are to attack up the Emmitsburg Road" (9:206).

Hood could not bring himself to attack. He later stated, "I could not reasonably hope to accomplish much ... In fact, it seemed to me that the enemy occupied a position so strong – I may say impregnable – that, independently of their flank fire, they could easily repel our attack by merely throwing and rolling stones as we approached" (9:207).

General Law joined General Hood. Law also recognized the severity of the situation and had sent his own scouts out to recon the area. General Law came to the same conclusion as General Hood. An attack up the Emmitsburg Road would be

fruitless and the plan should be modified to conduct a flanking maneuver on Little Round Top. Law had independently written out a formal protest to the order and offered it to Hood for endorsement. Hood signed the protest. Once again they sent a messenger to General Longstreet and again the reply was the same, "General Lee's orders are to attack up the Emmitsburg Road" (9:207).

One of Longstreet's staff officers arrived with a peremptory order to begin the attack at once. Hood's only choice at that time was to attack or give up his command. Hood turned to Law, and asked if he heard the order. Law turned away and later recounted, "I at once moved my brigade to the assault" (9:207).

General Longstreet later stated that the reason he rejected Hood's and Law's request to change the scheme of maneuver was because General Lee rejected his own similar request the day prior (9:206). The problem with that is Longstreet requested a strategic move involving the entire Army. The request by Hood and Law was a tactical one. Their request involved moving a division around the southern flank of the Round Tops. Many historians argue that Longstreet's feelings were hurt by General Lee's rejection of his strategic plan. Therefore, because of Longstreet's bruised ego and stubbornness, he refused to consider any modifications and executed Lee's plan to the letter.

The "what if" scenario of General Law's brigade hitting Colonel Chamberlain's 20th Maine does have some historical base. The possibility existed that a decision to attack from the flank could have been made. The situation could exist where one of Hood's brigades hit Chamberlain (in this case I will play Law's). Just as a commander's ego will influence his decision making, scenario 3 has its basis on another common occurrence. This is the occurrence of soldiers getting lost.

3.2.4.3 Scenario 3: Benning's Brigade Follows Law's Brigade and Attacks Chamberlain from the Flank. Hood planned to attack with his division in a box formation, moving southwest to northeast. Robertson was in the lead to

the left, Law beside him to the right, Benning behind Law, and Anderson behind Robertson. Hood told Benning between 2 and 3 o'clock in the afternoon of 2 July of the attack plan. Benning's brigade was to follow Law's brigade at a distance of about 400 yards.

Benning moved his brigade between 500 – 600 yards to the right so it could get into position. Once the brigade was ready the attack started. Hood's division advanced into a hail of artillery and infantry fire. The lead units of Benning's brigade soon became confused due to several woodlines and the firing to their front. After clearing one woodline, Benning could see a line of soldiers advancing about 400 yards to his front. Benning stated in his report, "The part of it [the line] in our front I took to be Law's brigade, and so I followed it. In truth it was Robertson's, Law's being farther to the right. This I did not discover until late in the fight, a wood on the right concealing from me most of Law's brigade" (26:168). Benning's brigade followed Robertson's brigade into the Devil's Den area instead of following Law. If Benning's brigade had followed Law as the plan intended, his brigade could have attacked Little Round Top also.

3.3 Data Collection Procedures

Data collection procedures for this project existed in two areas. The first was from historical data, the second was from the model execution. Of the two, collecting accurate historical data was the most time consuming.

3.3.1 Historical Data. The process of collecting historical data consisted of reading the references already listed until the events became clear in my mind. However, as with most accounts of the Civil War, not one can be called the definitive version. Several reasons account for this. First, no single person could be everywhere on the battlefield and record the events. The actions are a compilation of several accounts, each with its own degree of bias. Second, although the Official Records

provide detail into the actions of the units they rarely speak in terms of time. Most of the leaders would naturally be concerned with the immediate events and the questions of timing were addressed after the fact. Therefore, while two commanders may speak of the same event, the two may place different times on it. This adds to the confusion.

Third, the commanders of the two Union brigades and the battery which fought for the defense of Little Round Top were all killed or mortally wounded during the battle (26:12). These men were: Colonel Vincent, commander of Third Brigade, First Division, Fifth Army Corps; Colonel Weed, commander of Third Brigade, Second Division, Fifth Army Corps; and First Lieutenant Hazlett, commander of Battery D, Fifth U.S. Artillery. Other prominent leaders in the defense of little Round Top such as LTC O'Rorke, commander of the 140th New York died at Little Round Top. Colonel Rice, who succeeded Vincent in command of the Third Brigade, was also killed in battle a few months later (26:12). Perhaps, the battle may have been better defined if any of these men lived long enough to write their own personal accounts of the battle.

About the best anyone can do is weed out the common threads from the vast amount of resources and consider them valid assumptions.

3.3.1.1 Casualty Data. One method to compare the models with the historical battle is from the casualty data. Although I would not expect the numbers to be the same, a good model should reflect numbers that are somewhat comparable to other engagement outcomes during the Civil War. Without the book, *Regimental Strengths and Losses at Gettysburg* by John W. Busey and David G. Martin, collecting data on casualties would have been an extremely difficult task. The information relating to casualties from the following tables 3.3 – 3.6 are from the book (2).

Table 3.3. Confederate Strengths and Losses

Reprinted from (2)

UNIT	BATTLE STRENGTH	TOTAL LOSSES (k-w-mc)	PERCENT LOSS
Army of Northern Virginia	70136	22557+ (4559-12355-5643+)	32.2+
I Corps	20706	7661+	37.0+
Longstreet		(1584-4095-1982+)	
F&S	16	0	
Hood's	7375	2371	32.1
Division		(493-1341-537)	
F&S	11	1	
Law's	1933	500	25.9
Brigade		(99-253-148)	
F&S	4	2	
		(0-0-2)	
4 ALa	346	87	25.1
		(21-45-21)	
15 ALa	499	171	34.3
		(31-50-90)	
44 ALa	363	94	25.9
		(24-66-4)	
47 ALa	347	44	12.7
		(14-26-4)	
48 ALa	374	102	27.3
		(9-66-27)	
k: killed w: wounded mc: missing or captured F&S: Field grade and staff			

Table 3.4. Confederate Strengths and Losses (con't)
Reprinted from (2)

UNIT	BATTLE STRENGTH	TOTAL LOSSES (k-w-mc)	PERCENT LOSS
Robertson's	1734	603	34.8
Brigade		(152-313-138)	
F&S	5	1	
3 Ark	479	182	38.0
		(41-101-40)	
1 Tex	426	97	22.8
		(29-46-22)	
4 Tex	415	112	27.0
		(28-53-31)	
5 Tex	409	211	51.6
		(54-112-45)	
Anderson's	1874	726	38.7
Brigade		(151-473-102)	
F&S	10	1	
		(0-1-0)	
7 Ga	377	21	5.6
		(5-10-6)	
8 Ga	312	172	55.1
		(35-108-29)	
9 Ga	340	189	55.6
		(34-123-32)	
11 Ga	310	201	64.8
		(40-156-5)	
59 Ga	525	142	27.0
		(37-75-30)	
k: killed w: wounded mc: missing or captured F&S: Field grade and staff			

Table 3.5. Confederate Strengths and Losses (con't)

Reprinted from (2)

UNIT	BATTLE STRENGTH	TOTAL LOSSES (k-w-mc)	PERCENT LOSS
Benning's	1420	514	36.2
Brigade		(86-279-149)	
F&S	4	1	
		(0-1-0)	
2 Ga	348	102	29.3
		(25-66-11)	
15 Ga	368	171	46.5
		(14-58-99)	
17 Ga	350	103	29.4
		(22-70-11)	
20 Ga	350	137	39.1
		(25-84-28)	
Henry's	403	27	6.7
Arty Bn		(5-22-0)	
F&S	9	1	
		(0-1-0)	
Latham's NC Bat	112	3	2.7
		(1-2-0)	
Bachman's SC Bat	71	?	
Garden's SC Bat	63	7	11.1
		(2-5-0)	
Reilly's NC Bat	148	6	4.1
		(2-4-0)	
k: killed w: wounded mc: missing or captured F&S: Field grade and staff			

Table 3.6. Union Strengths and Losses

Reprinted from (2)

UNIT	BATTLE STRENGTH	TOTAL LOSSES (k-w-mc)	PERCENT LOSS
Army of the	93693	22807	24.3
Potomac		(3149-14501-5157)	
Vincent's	1336	352	26.3
Brigade		(88-253-11)	
3-1-5			
F&S	1	1	
		(0-1-0)	
20 Me	386	125	32.4
		(29-91-5)	
16 Mich	263	60	22.8
		(23-34-3)	
44 NY	391	111	28.4
		(26-82-3)	
83 Pa	295	55	18.6
		(10-45-0)	
Weed's	1484	200	13.5
Brigade		(40-142-18)	
3-2-5			
F&S	4	1	
		(1-0-0)	
140 NY	447	133	29.8
		(26-89-18)	
146 NY	454	28	6.2
		(4-24-0)	
91 Pa	219	19	8.7
		(3-16-0)	
155 Pa	360	19	5.3
		(6-13-0)	
Hazellet	68	13	19.1
D 5 US ART		(7-6-0)	
k: killed w: wounded mc: missing or captured F&S: Field grade and staff			

Table 3.7. Union Strengths and Losses (con't)

Reprinted from (2)

UNIT	BATTLE STRENGTH	TOTAL LOSSES (k-w-mc)	PERCENT LOSS
Fisher's	1605	55	3.4
Brigade		(6-49-0)	
3-3-5			
F&S	1	0	
5 PaR	284	2	.7
		(0-2-0)	
9 PaR	320	5	1.6
		(0-5-0)	
10 PaR	401	5	1.2
		(2-3-0)	
11 PaR	327	41	12.5
		(3-38-0)	
12 PaR	272	2	.7
		(1-1-0)	
k: killed w: wounded mc: missing or captured F&S: Field grade and staff			

3.3.1.2 Data Collection Per Game Turn. The data collection procedures for each game turn required keeping track of the casualties for each unit as well as the time lines for each attack. Due to each game's design, the casualties had to be interpolated. The lowest level maneuver unit illustrated on a counter was either an A or B unit from a brigade (*Gettysburg, The Turning Point*) or the unit was divided between an extended line (*Thunder at the Crossroads*). I proportioned the casualties per regiment commensurate to the regiment's proportional strength to the brigade strength on the counter. This method seemed to work the best.

3.3.2 Model Structure. The purpose of this section is to discuss the structure of each of the combat models. A good wargame's structure should focus on facilitating decision making and allow players to learn from their decisions (28:165). Although the wargames are structurally different, they both make use of the same key elements. I used a combination of Combat Modeling class notes, and a discussion from *The Art of Wargaming* by Peter Perla to develop a framework to discuss each of the wargames. The framework contains a discussion of the:

- Model Overview
- Components
- Rules
- Sequence of game turns
- Combat processes
- Characteristics

3.3.2.1 Model Overview. The model overview section provides an overall description of the game. The overview section consists of: who made the model, what was the designer's objective, the scope, and scenarios that one could use. Each model should have clearly defined objectives that become the principle

drivers to its structure. The scope of each model is the level at which the action takes place. The scenario sets the stage for the game by placing the players in specific situations and providing them a context to base their decision making. Once we establish the "big picture," a more detailed examination of each model can take place.

3.3.2.2 Components. The model components are the pieces that make up the game such as the game board, counters, and tables. I examined the components for attention to detail, completeness and historical precision. The ability of the game board to model the terrain was important because of the influence of the terrain on the decisions of the actual soldiers who fought there. I examined the information contained on the counters and their relationship to the game play. The game's tables are important because they translate the game's data and the player's decisions into game events. The strengths and weaknesses of the components directly reflected on the game's realism and the ability to recreate the historical events (16:21).

3.3.2.3 Rules. The rules control how and when the action takes place. I examined the rules to ensure the players received the appropriate quantity and quality of information during play. Too much or too little information can place the player in an unrealistic position which can be detrimental to the game. The control of information is very difficult in a wargame.

3.3.2.4 Game sequence. The game sequence provides a logical sequence for the players to exercise their decision making. The sequence should be give-and-take and support the game designer's objectives.

3.3.2.5 Combat processes. I will describe the combat processes of command and control, movement, combat, and combat service support to illustrate how each supports the designer's objectives and the realism associated with each.

3.3.2.6 Model Characteristics. The model characteristics concern the issue of someone learning to play the game. The issues of resolution level, learning time, playing time, documentation, and flexibility are important to anyone who may want to use the games for himself to discover other insights. Definitions for each term are in Table 1.8.

Table 3.8. Model Characteristics

Characteristic	Description
Resolution level:	The military unit level where the action takes
	place in the model.
Learning time:	The length of time required to read, understand,
	and become familiar with the rules in order to
	play the game.
Playing time:	The length of time required to play the scenario.
Documentation:	The quality of the documentation as it affects
	the play of the model.
Flexibility:	The ability of the wargame to adapt to
	various "what if" scenarios.

3.4 Model Analysis

The final step of the approach to the problem is the analysis of the models. The purpose of the model analysis is to examine the important driving characteristics of each scenario, the decision making rationales for each side, and how alternative choices might have changed the course of events. The analysis methods must support the following research objectives:

- To compare the combat outcome of the battle of Little Round Top with the results obtained from two commercial models
- To determine what changes are required in the model to make it more representative of the historical combat

- To determine the sensitivity of the combat outcome to changing the scenarios based on possible force ratios and sequence of events given a good relationship between the models and the historical battle

The next step is to establish a common set of measures of effectiveness to represent the results of each scenario and to evaluate the effects of the decision alternatives.

3.4.1 Measures of Effectiveness. In the book, *Systems Analysis and Policy Planning: Applications in Defense*, L.D. Attaway states that measures of effectiveness should reflect the "Essence of the problem and make measurement both feasible and as easy as possible" (1:61). The aim of developing good measures of effectiveness is to obtain a quantitative relationship between cost and effectiveness. In terms of the battle of Little Round Top, cost relates to casualties and effectiveness relates to success in taking the hill.

The complexity of the problem requires more than one measure of effectiveness. One measure of effectiveness is not likely to be a reliable indicator of the battle outcome. Sometimes the data does not provide all the information and it is necessary to compare the results qualitatively. Therefore, I will use a combination of both quantitative and qualitative measures of effectiveness.

I will use the following quantitative measures of effectiveness in the ground combat analysis:

- Rate of advance
- Time to reach objective
- Attrition rate inflicted on enemy
- Total attrition inflicted exchange rate (enemy to friendly casualties)

3.4.2 Research Objectives. To support the first research objective, I will use the above results as a source of comparison to the battle. The primary measure of effectiveness in ground combat analysis is the probability of success subject to casualty and time constraints. However, it is not possible to run enough samples to provide a credible estimate of the probability of success in achieving a given mission. In the case of the battle of Little Round Top, history has provided us one data point for comparison. Given the same force ratios, weapons systems, locations etc., if the battle was hypothetically refought the results could be entirely different. History is filled with atypical battles. Therefore, I can compare the data from the models to the actual battle but to draw a statistical conclusion about the models does not serve their intended purpose. The purpose of comparing the casualty and time constraints of the model to the battle results is to gain insights into the decision making and a perspective on why the events occurred as they did.

The support of the second research objective is a more qualitative problem. Comparing the data results to the battle will provide some insight. However, aligning the model closer to the battle outcome may effect the designer's goals for the game. The solution will lie in how the game is "balanced." Balance has two meanings: one for a wargame hobbyist and one for a combat modeler. The hobbyist would define balance as the historical "realism" compared to the ease of game play. The combat modeler will define a balanced model as one that addresses each of the combat processes equivalently. One important point is that a successful model may not necessarily be balanced. For the purpose of the model, a successful one needs to be like the real thing.

To support the third research objective, I will use the idea of a position defense. The premise to the position defense is that one can compare courses of action primarily on the basis of casualties sustained to achieve the mission (it is better to hold the position with a few rather than many casualties). The position defense

calls for holding ground preferably in a forward line and certainly at a second line, to ensure that the overall defense plan of the higher echelon is not compromised.

One problem with the position defense is to differentiate between a complete or partial success as well as failure. A study conducted by Tiede and Leake (1971) addressed the problem of rank ordering mission accomplishment. Their results provided the following framework to rank the combat outcomes from highest to lowest:

- Unqualified Success: within this class the one that leaves the unit strength highest relative to the enemy's strength ranks first.
- Next Class: either the unit held at a secondary line and ended the combat stronger than the enemy or the unit held in the primary line but was weakened relative to the enemy.

3.5 Summary

This chapter laid out in detail the approach to the problem. The process of breaking the problem down into smaller subproblems allowed me to focus on one aspect at a time. When the subproblems are pieced together a thorough examination develops. The following chapter provides a description of the battle of Little Round Top.

IV. The Battle of Little Round Top

4.1 Introduction

The purpose of this chapter is to provide a description of the events during the battle of Little Round Top. The description divides the battle into the background, plan, attack, defense, and the aftermath. Many references of the battle try to describe the actions of both sides at the same time. For the uninitiated, trying to track the battle becomes very confusing. This review of the battle separates the attack and defense for clarity reasons. Norton described the battle in *The Attack and Defense of Little Round Top* using this technique and it was very helpful.

4.2 Background

The battle of Gettysburg represented a crucial point in the American Civil War. For this reason, many refer to it as the high water mark for the confederacy. A confederate victory would threaten the Union capital, possibly invite international recognition from Europe, and most important, provide a catalyst for a negotiated peace with the North (8:225-228). With so much at stake for both sides, it is clear why the battle is considered one of the most significant events of the Civil War.

General Lee originally did not intend to conduct an attack in the Gettysburg area. However, the unexpected engagement on 1 July forced the issue. Several factors were going against Lee. Without Stuart's cavalry, Lee knew very little about the terrain and enemy dispositions of the North. His supply trains overflowed due to the success of his re-supply activities over the past several days and a withdrawal through the mountains westward would be very slow and difficult. He felt his Army would become easy prey for the Union.

To remain at Gettysburg and establish a defense also had disadvantages. Lee felt he could not wait for a Northern attack because the presence of the Union army would restrict his foraging activities and the Union forces would eventually box him

in by closing off his escape routes through the mountains. The battle had almost become unavoidable (24:50). Lee hoped to continue the success of the first day's battle and achieve a crushing victory.

Different historians will point to one part or another during the battle of Gettysburg and claim that portion of the battle dictated the outcome. Clearly, one of these points would be the battle of Little Round Top. The importance of the battle cannot be understated. The bloody opening engagements on 1 July became a meeting engagement between portions of the two armies. However, by the afternoon of the 2nd both armies had arrived on the battlefield in force. The battle of Little Round Top represents the first main attack on the Union line on 2 July. General Lee decided to execute the main attack of the Confederates against the left of the Union line in an effort to roll their flank. If the attack was successful General Lee could:

- Capture the Union supply trains
- Cut General Meade's lines of communication with Washington
- Force General Meade to leave his strong position and attack the Confederates in the open
- Threaten Washington or Philadelphia

General Lee saw a golden opportunity to strike the Union. The following paragraphs will describe the battle of Little Round Top.

4.3 The Plan

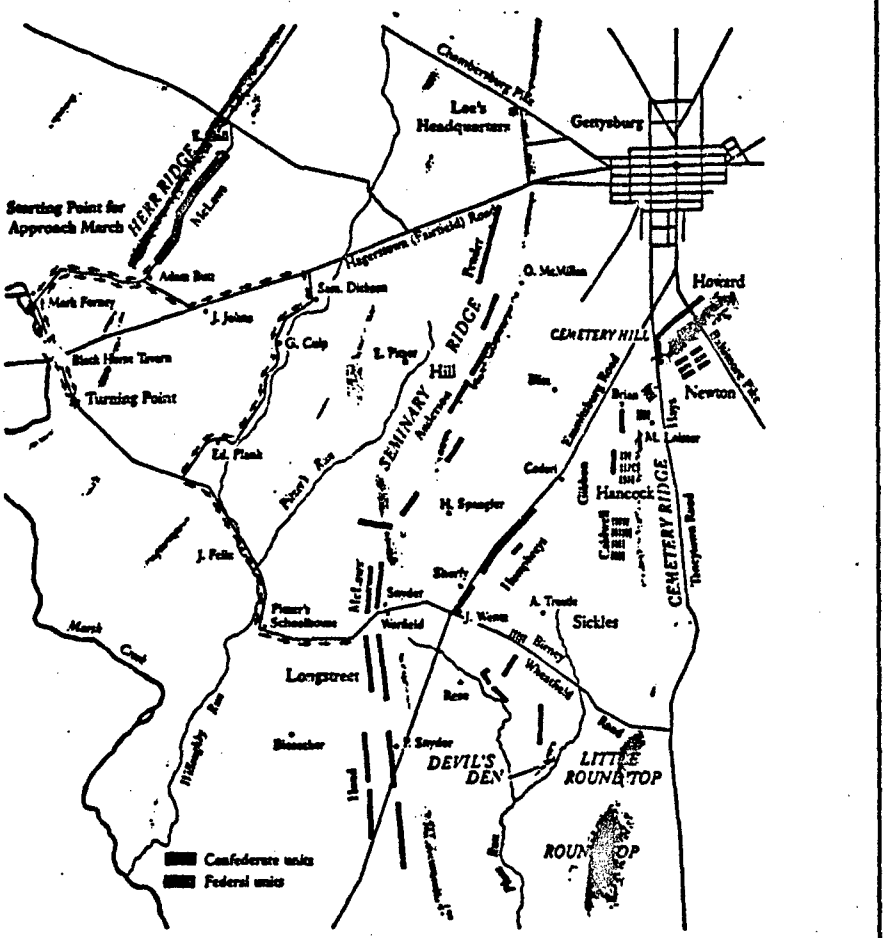
On the morning of 2 July, 1863, the Union Army occupied strong positions on Cemetery and Culps Hill. Their position extended southward on the high ground along the Emmitsburg Road down to Little Round Top. The ridge was difficult to ascend particularly on the northern end at Cemetery Hill and in the southern end at the Round Tops. There were numerous stone and rail fences along the slope that would afford good protection for the Union while impeding the advance of the

Confederates. To the front of the position, the ground was undulating and generally open for about three-quarters of a mile.

Lee wanted to initiate the attack with Longstreet's corps attacking in echelon up the Emmitsburg Road. The intent was to hit the southern flank of the Union, establish Confederate artillery fire from Little Round Top, and roll the flank northward toward Cemetery Hill. General Lee ordered General Hill to attack the Union center strong enough to fix the forces in that location and to prevent reinforcements from being shifted to either wing. Lee also ordered General Ewell to make a simultaneous demonstration on the Union's northern flank at Culps Hill. Lee gave Ewell the latitude to develop the situation into a general attack if the opportunity presented itself. Lee based his decision on reconnaissance conducted earlier in the morning which confirmed the southern portion of the Union line was open.

After a series of marches and countermarches in an attempt to conceal their movements from a signal station atop Little Round Top, Longstreet's corps, consisting of Hood's and McLaw's divisions, arrived in the attack position on the west side of the Emmitsburg Road about 3:30. The corps extended from its northern most unit across from the Peach Orchard down to its southern most tip to the west of Bushman's Woods. By the time Longstreet's corps got into the attack position, General Sickles had moved his Third Corps forward into the Peach Orchard, Wheatfield, and Devil's Den area. The flank was no longer open, instead, Longstreet's corps was face to face with Sickles' corps (see Figure 4.1).

Earlier that morning, General Sickles, the Union III Corps commander, moved two of his divisions forward. He placed General Humphries' Second Division on the right along the Emmitsburg Road with his left at the Peach Orchard. Humphries was oriented facing Seminary Ridge. General Birney's First Division, consisting of Graham's, De Trobriand's, and Ward's brigades, occupied a line starting at the Wheatfield oriented southwest at a forty-five degree angle to the Emmitsburg Road. General Graham's brigade was to the right closest to the Peach Orchard. Colonel



1. Longstreet's march began on Herr Ridge. The head of McLaws's division probably followed the route indicated. Hood's division probably followed McLaws's between the Fairfield Road and Pitzer's Schoolhouse.

2. The approximate positions occupied by the brigades of both armies on the Union left and Confederate right prior to the assault are shown. Much of the Federal Second Corps was formed in masses or columns and not in line.

Figure 4.1. Initial Troop Positions 4:00 PM, 2 July, 1863
Reprinted from (27)

De Trobriand's brigade occupied the center of the Division. General Ward was the left most brigade. His brigade was among the rocks in Devil's Den near the Plum Run valley. This valley separated his position from the western slope of Little Round Top (26:253).

Hood's attack plan called for a box formation, moving southwest to northeast. Robertson's brigade was in the lead to the left, Law's brigade beside him to the right, Benning's brigade behind Law, and Anderson's brigade behind Robertson. The four batteries of the division were massed on its left. McLaws formed his division consisting of the brigades of Kershaw, Semmes, Barksdale, and Wofford in the same order and he also put his four batteries of artillery on the left (26:254).

Once Generals Hood and McLaws brought their divisions into the attack position, both realized their dangerous situation. The Union southern flank extended past their own southern flank. When General Lee gave the order at a location over 2 miles away on Seminary Hill, he did not know of the current disposition of forces. An attack in echelon up the Emmitsburg Road would actually expose the Confederate flank to the Union.

General Hood sent scouts to recon the area south of the ridge that projected westward from the Devil's Den. This area marked the end of the Federal line. The scouts reported to Hood the area south of the Round Tops was clear. They had discovered the Union supply trains in the rear and a clear path to take them (5:382). Hood sent a messenger to General Longstreet. Hood felt, "It was unwise to attack up the Emmitsburg Road as ordered." Instead, he pointed out the exposed Southern end of the Round Tops and urged Longstreet to allow him, "To turn the Round Top and attack the enemy in the flank and rear" (9:205).

Hood felt confident his suggestion fulfilled the intent of Lee's order. However, Longstreet reply was, "General Lee's orders are to attack up the Emmitsburg Road" (9:205).

Hood and McLaws were surprised by Longstreet's answer. Once again they sent a messenger to Longstreet requesting a change to the order. The messenger returned with the same reply, "General Lee's orders are to attack up the Emmitsburg Road" (9:206).

Hood could not bring himself to attack. He later stated, "I could not reasonably hope to accomplish much ... In fact, it seemed to me that the enemy occupied a position so strong – I may say impregnable – that, independently of their flank fire, they could easily repel our attack by merely throwing and rolling stones as we approached" (9:207).

General Law joined General Hood. Law also recognized the severity of the situation and had sent his own scouts out to recon the area. General Law came to the same conclusion as General Hood. An attack up the Emmitsburg Road would be fruitless and the plan should be modified to conduct a flanking maneuver on Little Round Top. Law had independently written out a formal protest to the order and offered it to Hood for endorsement. Hood signed the protest. Once again they sent a messenger to General Longstreet and again the reply was the same, "General Lee's orders are to attack up the Emmitsburg Road" (9:207).

One of Longstreet's staff officers arrived with a peremptory order to begin the attack at once. Hood's only choice at that time was to attack or give up his command. Hood turned to Law, and asked if he heard the order. Law turned away and later recounted, "I at once moved my brigade to the assault" (9:207).

General Longstreet later stated that the reason he rejected Hood's and Law's request to change the scheme of maneuver was because General Lee rejected his own similar request the day prior (9:206). The problem with that is Longstreet requested a strategic move involving the entire Army. The request by Hood and Law was a tactical one. Their request involved moving a division around the southern flank of the Round Tops. Many historians argue that Longstreet's feelings were hurt by General Lee's rejection of his strategic plan. Therefore, because of Longstreet's

bruised ego and stubbornness, he refused to consider any modifications and executed Lee's plan to the letter.

4.4 The Attack

About 4:00 Colonel Alexander (Longstreet's artillery commander) received word that "All was ready" in Longstreet's corps, at his signal fifty-four artillery cannons opened up on the Union line (5:386). Shortly thereafter, the advance of Hood's division began what Longstreet later proclaimed to be the "Best three hours' fighting ever done by any troops on any battlefield" (5:386).

The ground over which the Confederates advanced was very rocky and rough. Numerous stone fences and other obstructions made keeping close formations difficult. Additionally, as soon as their advance was seen, the Union artillery opened fire on them. At first they fired shell; however as Hood's men approached closer, the artillery changed to canister. The infantry and artillery fire made command and control nearly impossible (26:255).

Hood's lead brigades continued their advance. General Robertson's brigade consisted of from right to left: 5th Tex, 4th Tex, 1st Tex, and 3rd Ark. Law's brigade consisted of from right to left: 48th Ala, 44th Ala, 15th Ala, 47th Ala and 4th Ala. According to Robertson's official report, Longstreet's order called for him to keep the left of his brigade along the Emmitsburg Road and the right of his brigade close to Law's left flank (26:150). As Law's brigade continued their advance, they started to drift to their right. This made the 4th and 5th Tex regiments of Robinson's brigade follow with them as they stayed tight to the 4th Ala of Law's brigade.

Robertson's left flank began to take fire from Ward's brigade in the Devil's Den. He turned the two regiments he had with him, 1st Tex and 3rd Ark, and assaulted. He then sent a messenger to get the rest of his brigade. However by that

time, the two regiments with Law had advanced too far towards Big Round Top to be of any value to Robertson.

General Law continued his attack east towards Big Round Top. Instead of reorienting his brigade to the northeast, he ordered the two regiments on his right flank (48th and 44th Ala) to stop and then move behind the regiments to their left. The 44th and 48th Ala regiments executed Law's order but when they swung left they strayed too far and ended up on the left side of the 5th and 4th Tex units of Robinson's brigade. Law's brigade now consisted of from right to left: 15th Ala, 47th Ala, 4th Ala, 5th Tex, 4th Tex, 48th Ala, and the 44th Ala (see Fig 4.2).

The troubles for the 15th Alabama, commanded by Colonel William Oates were just beginning. In addition to having the responsibility of holding the Confederate right flank, Oates regretted having to advance before a detail of twenty-two men who had gone to fill canteens could return with the water. Oates later stated that due to the heat, the lack of water "contributed largely " to his failure to take Little Round Top (5:392).

As Colonel Oates' men pushed into the woodline at the western base of Big Round Top, they engaged Major Homer R. Stoughton's detachment of 2nd United States Sharpshooters, who were positioned behind a stone wall (5:392). After Oates got into the woods the Union sharpshooters broke contact and dispersed to Oates' flanks. The action by the sharpshooters led Oates to believe that he was walking into an ambush. Oates then received an order from Law's to wheel his line to the left and attack towards Devil's Den. Oates disregarded the order claiming the 47th Ala was crowding in on his left and he could not execute the maneuver without adding to the confusion. Oates then put his soldiers on line along with the 47th Ala (General Law gave Oates temporary control over them (5:392)) and pushed to the top of Big Round Top. Once at the top, he stopped briefly to give his soldiers a water break and then attacked down the northeast side of the mountain.

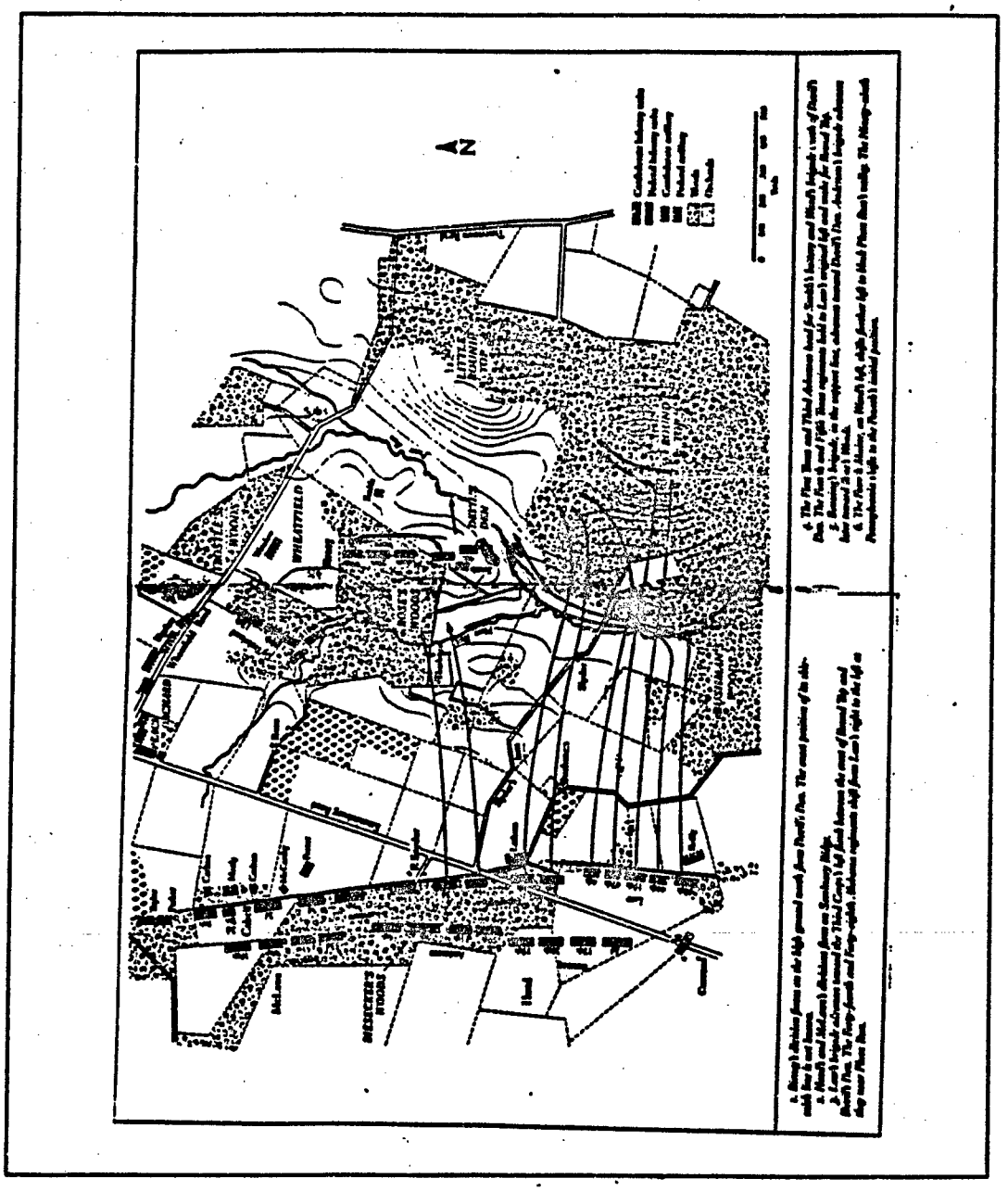


Figure 4.2. Confederate Advance to Little Round Top
Reprinted from (27)

Oates came out in a level and thinly wooded area between the Round Tops. From there he could see a number of Federal ordnance wagons. The wagons belonged to Lieutenant Hazlett's Battery D, 5th United States Artillery, who's battery was soon to play a major role in the defense of Little Round Top. At that point, Oates thought nothing stood in his way of pillaging the rear of the Union lines (5:393).

As Oates climbed Big Round Top, the other regiments in Law's brigade including the 4th and 5th Tex from Robinson's brigade, cleared the western slope of Big Round Top. They were making their way through the valley to Little Round Top when General Law ordered Colonel Perry, the regimental commander of the 44th Ala, to wheel to the left and attack Smith's Union artillery battery at Devil's Den (26:257). Smith was firing into the flank of the brigade's assault and creating havoc within the Confederate lines. Colonel Perry promptly turned his regiment to the left and attacked directly into Devil's Den (see Fig 4.3).

As the 44th Ala assaulted Smith's Battery at Devil's Den the remaining regiments (4th, 48th Ala and 4th, 5th Tex) continued to rush the southwest slope of Little Round Top hoping to get there before any Union soldiers had an opportunity to establish a defense. However, they were met by skirmishers from the 44th NY and 83rd Pa. Colonel Vincent, commander of Third Brigade, First Division, Fifth Corps, had just arrived on Little Round Top and put his skirmishers out as the rest of his brigade started to prepare their defense. The Confederates fought through the screenline and made their initial assault on Little Round Top. The battleline consisted of from right to left: 48th Ala, 4th Ala, 5th Tex, and the 4th Tex. The 4th Tex extended a little over Vincent's northern flank (26:257–258).

The rocks on Little Round Top provided excellent cover for Vincent's men. They held off the initial assault. The Confederates backed off and tried further to Vincent's left, near the 20th Maine but once again the Union soldiers denied them.

The left side of Law's brigade (4th, 5th Tex, and 48th Ala) could not penetrate Vincent's center so they backed down into the Plum Run valley to work their way

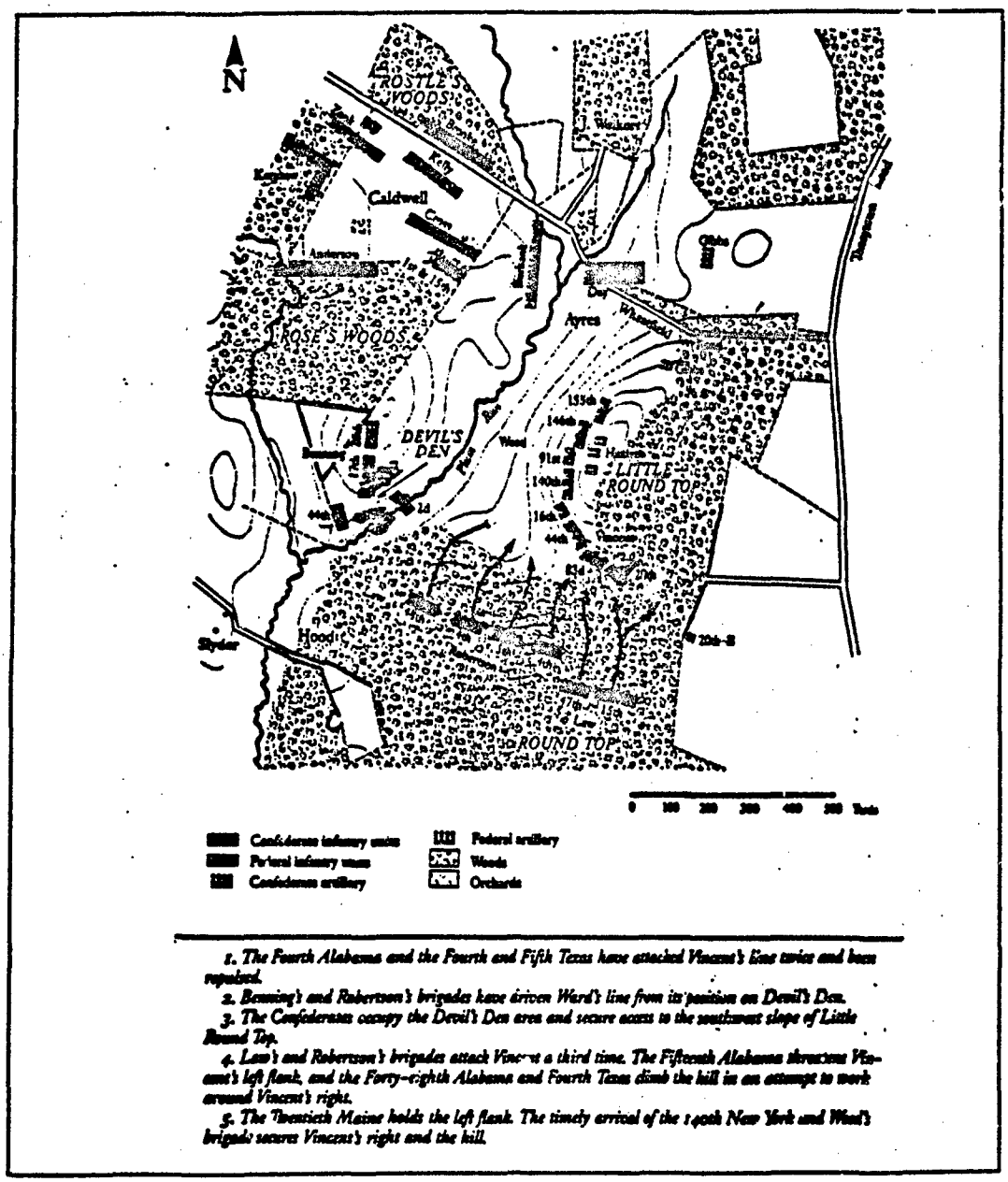


Figure 4.3. Initial Assault

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north to Vincent's right flank. By this time Ho[illegible]'s other brigades had successfully driven General Ward's brigade and Smith's artillery battery out of Devil's Den. This made the way clear for the 4th and 5th Tex, and the 48th Ala to make their way northward behind the protection of the big rocks between Plum Run and the west side of Little Round Top. They eventually made their way far enough so that when they turned toward Little Round Top, they hit the right flank of the 16th Mich. The 16th Mich was the extreme right of Vincent's brigade (26:259).

The 4th and 5th Tex, and the 48th Ala began their assault by scaling the western slope of Little Round Top in a southeasterly direction. From this angle, they made a fierce assault on the right three companies of the 16th Mich. The opposing forces engaged in hand to hand combat and the Confederates gained the advantage. The 16th Mich broke and about one third of the regiment (including the commander and the colors) retreated back up and over the west side of Little Round Top. Colonel Vincent saw that his defense was giving way. He ran over to rally the soldiers only to be shot dead by the oncoming wave of Confederates. The Confederates appeared to have gained a foothold and were ready to roll the Union flank.

Just as the Michigan line broke, the 140th NY came up to the right of the 16th Mich and charged into the assaulting Confederates. The 140th NY drove the southerners down Little Round Top towards Plum Run. The head on collision with the 140th NY and the subsequent push back down the hill devastated the Confederates. After three bloody unsuccessful attempts to take the hill many gave up or stayed behind the cover of the rocks at Devil's Den (26:260). Union soldiers swept the west slope of the hill and this marked the end of any serious threat to the right flank of Little Round Top.

As the assaults were happening on Vincent's right, Colonel Oates maneuvered his men over on the left flank. Colonel Oates thought he had the Union flank; however, he began to receive fire. Oates figured the force was part of the Union

sharpshooters he engaged on Big Round Top and they were now taking a stand on the lower slopes of Little Round Top. However, this was not the case. Colonel Oates' men were now about to have their famous confrontation with Chamberlain's 20th Maine.

The men of the 15th Ala rushed the 20th Maine and were met with fire so destructive they "Wavered like a man trying to walk into a strong wind" (27:231). Oates sent his adjutant, Captain Waddell with about 50 men further to the right. They advanced to a position from which they could enfilade both Chamberlain's regiment and the 83rd Penn. The enfilading fire devastated Chamberlain's line. Chamberlain refused his left flank. This caused his line to have a "V" shape (4:51). A series of charges and countercharges ensued for over an hour. Fighting was hand to hand in several places with no fixed line and resulted in heavy casualties on both sides.

Oates feared his regiment was running out of gas. He also received reports that an enemy force of about two-hundred was closing to his rear (27:234). These soldiers were probably members of Captain Morrill's Company B, 20th Maine. Chamberlain sent them to secure the Union left flank on the east side of the saddle between the Round Tops. Morrill's men linked up with the sharpshooters who hit Oates earlier on Big Round Top. Oates could see he was losing control of the situation and ordered a retreat.

Whether Oates ever gave an order to retreat or not is a controversy among historians. Many believe the order was Oates' way of reconciling the mass retreat of his forces in the face of Chamberlain's bayonet charge. According to Oates, "I ordered a retreat ... When the signal was given we ran like a herd of wild cattle" (27:235). Oates ran back to Big Round Top while many in his regiment surrendered. He ran beside Pvt John Keels, Keels had a bullet hole in his windpipe and as he ran, his heavy breathing sprayed blood on Oates (27:235).

As Oates brought his unit back towards Big Round Top, they were hit by Captain Morrill's men and Major Stoughton's sharpshooters. The Union soldiers had the cover of several stone fences and their fire devastated the already beaten Confederates. Oates believed he was hit by two regiments (5:394). The Confederates ran for their lives up Big Round Top with Chamberlain's men in pursuit. As Chamberlain's men made their final sweep of the 15th Ala, Little Round Top was secure and the Confederate assault ended.

4.5 The Defense

"Warren! I hear a little peppering going on in the direction of the little hill off yonder. I wish that you would ride over and if anything serious is going on ... attend to it," said General Meade. General Meade made the request about 3:10 while the Generals rode south along Cemetery Ridge on their way to inspect the Third Corps position. Meade continued on his way to see General Sickles, commander of Third Corps. In accordance to General Meade's wishes, General Warren rode to the "little hill" and consequently rode to prominence and a small place in history (27:201).

When Warren arrived on the crest of Little Round Top, the hill was unsecure except for a couple of signal officers. They told Warren they thought they saw troops in the woods between Plum Run and the Emmitsburg Road. Warren sent an aide down to Smith's battery which occupied the Devil's Den with orders to shoot into the woods where the Signal officers thought they saw the Confederates. Warren describes the artillery fire:

> As the shot went whistling through the air the sound of it reached the enemy's troops and caused every one to look in the direction of it. This motion revealed to me the glistening of gun-barrels and bayonets of the enemy's line of battle, already formed and far outflanking the position of any of our troops; so that the line of his advance from his right to Little Round Top was unopposed. I have been particular in telling this, as the discovery was intensely thrilling to my feelings, and almost appalling. (27:206)

Little Round Top was left unsecure because earlier that day General Sickles moved his corps forward into the Peach Orchard, Wheatfield, and Devil's Den area without the consent of General Meade. General Sickles' actions exposed the Union left flank to attack from the most commanding terrain feature in that area: Little Round Top (18:39).

Warren realized he did not have much time before the Confederates attacked. If the Confederates gained control of Little Round Top, they could unhinge the Union left flank. Warren sent a message to General Meade requesting a division occupy Little Round Top as soon as possible. He also sent one of his aides, Lieutenant Ronald S. Mackenzie, to Sickles with an urgent request to send a brigade to occupy the hill. Sickles refused stating that he needed his whole command to defend his front (27:206). Sickles told Mackenzie to try General Sykes, the commander of Fifth Corps. Mackenzie found Sykes near the Wheatfield, Sykes had halted his corps to the rear and was up to the front to recon the forward positions (26:263). Sykes agreed to the request and sent his aide to General Barnes, his First Division commander, with an order to detach a brigade.

The aide rode back to Barnes' division to relay the order to Barnes. As the aide rode up to the head of the division column, Colonel Vincent sat on his horse waiting for orders. Vincent rode forward to meet the aid and accord' ıg to Norton (who rode forward with Vincent because he was the color bearer), the following conversation took place (26:264):

> Vincent asked,"Captain, what are your orders?"
> The Captain replied, "Where is General Barnes?"
> Vincent said,"What are your orders? Give me your orders."
> "General Sykes told me to direct General Barnes to send one
> of his brigades to occupy that hill yonder," said the
> aide while pointing to Little Round Top.
> Vincent replied, "I will take the responsibility of taking
> my brigade there."

Taking the initiative, Vincent rode back to his brigade and ordered Colonel Rice, his senior Colonel, to take the brigade to Little Round Top. Vincent rode ahead to recon positions.

Vincent and his color bearer, Norton, first tried to climb the northwest slope of Little Round Top. However the slope was too difficult for horses to climb so they rode around to the east side. They climbed the hill toward the crest on the southern end. They crossed the slope for about three-hundred yards and came to a spur that extends from the hill to the southeast at an elevation about twenty feet lower than the south end of the crest. This spur was later called Vincent's spur (27:209).

Colonel Rice soon arrived and Vincent laid in the defense. Vincent first put in the 16th Michigan oriented toward the southwest and Devil's Den. The 44th NY formed along the western edge of the spur joining the left of the 16th Mich. The 83rd Pa was to the left of the 44th NY. Their orientation was west with a portion facing south towards Big Round Top. The 20th Ma held the left of Vincent's defense. Vincent positioned Chamberlain stating, "I place you here! This is the left of the Union line. You understand. You are to hold this ground at all cost!" Chamberlain later recalled, "I did understand ... full well; but had more to learn about costs" (4:48).

Each regiment sent out skirmishers as soon as they got into position. The skirmishers from the 83rd Pa and the 44th NY immediately engaged Confederate infantry as they pushed up the slope. The Confederates fought through the skirmishers, hit the center of Vincent's line and were forced back. Once again the Confederates tried, this time moving a little to the Union's left. They then backed down the slope into the protection of Devil's Den where they started to follow Plum Run north in an effort to swing around and hit Vincent's northern flank.

As the Union line continued their defense General Warren realized he needed reinforcements. He spotted a column of soldiers on the rode to the Peach Orchard. He quickly rode down to intercept them. The soldiers were from his old brigade.

They were from Second Division, Fifth Corps. The brigade was now commanded by Colonel Weed. General Sykes had ordered Weed to reinforce Vincent earlier; however, an aide to General Sickles diverted the brigade by sending them to Sickles part of the line. Weed had gone ahead to recon positions when Warren came racing towards the column. The highest ranking officer in charge at that time was Colonel Patrick O'Rorke, commander of the 140th NY. O'Rorke knew Warren so when Warren asked for help, O'Rorke immediately turned his regiment and was on his way to Little Round Top (5:395).

When General Warren went down the hill to get reinforcements, he also got Lieutenant Hazlett of D Battery, 5th United States Artillery. Hazlett raced back to Little Round Top to provide artillery support. He tried to get his guns, 10 pound Parrotts, up to a working place on the summit. Due to the steep slope, he had to take his horses off and lift the guns by hand up to the top (4:51). Once in position, the steep slope caused the guns to be angled high. He could not get effective fire on the onrushing Confederates to his immediate front, but he was able to provide excellent fires into the Devil's Den. The presence alone of the artillery probably instilled some confidence to the defenders.

The 4th and 5th Tex along with the 48th Ala made their third and final assault on Vincent's line. This time they hit the flank of the 16th Mich. The actions of the 16th Mich remain controversial to this day. Many claim the regiment broke ranks and retreated over Little Round Top. However according to their commander, Jasper Welch, the regiment fell back because, "Someone (either General Weed or General Sykes) called from the extreme crest of the hill to fall back nearer to the top" (18:39). In either case, the confederates were on top of the 16th Mich and were about to roll the flank. Colonel Vincent ran over to rally his soldiers and he was shot dead.

Colonel O'Rorke arrived with the 140th NY just in the nick of time. Without slowing down, the Colonel led his men down the slope next to the 16th Mich. O'Rorke drew his sword and yelled, "Down this way boys!" and his regiment followed

(27:228). O'Rorke's column ran down the slope stopping about 40 feet in front of the Confederates. Firing between the two sides started and O'Rorke was killed instantly. The timely appearance of the 140th NY was just enough to turn the tide of the battle. The Confederates were devastated. Many surrendered or ran back for cover to Devil's Den. This marked the end to the assaults on the right flank of Little Round Top. Shortly thereafter, Colonel Weed brought up the rest of his brigade and they formed to the right of the 140th (see Fig 4.4).

The initial Confederate assault was on the center of Vincent's line. However, it did not take long before Colonel Chamberlain received reports of enemy soldiers to his front. Soon the 15th Ala and the 20th Ma were locked in close quarters combat. The fighting tossed and turned with several attacks and counterattacks. Chamberlain climbed on a rock and saw a large body of Confederates moving towards his left (27:232).

Chamberlain had to adjust to the flank attack. He knew the consequences if the Confederates turned his flank. He ordered his commanders to keep a strong base of fire to the front and at the same time to begin taking side steps to the left so that the regiment would eventually be on line. Chamberlain then took the colors and placed them at the extreme left. He then refused his left wing at right angles to his right. This gave his formation the shape of a "V" (4:50). Chamberlain's soldiers kept such a strong base of fire, the Confederates never knew of the thinning of the lines (27:232).

Chamberlain's maneuver repulsed the flank attack. However the 20th Ma was under severe enfilading fire from its left. The center of the "V" was shot out and only two of the color guard were left. As the smoke cleared Chamberlain could see his color sergeant, Andrew Tozier on a rock holding the colors in one hand while firing his rifle with the other (4:51). Chamberlain wanted to reinforce the middle but he was running out of men.

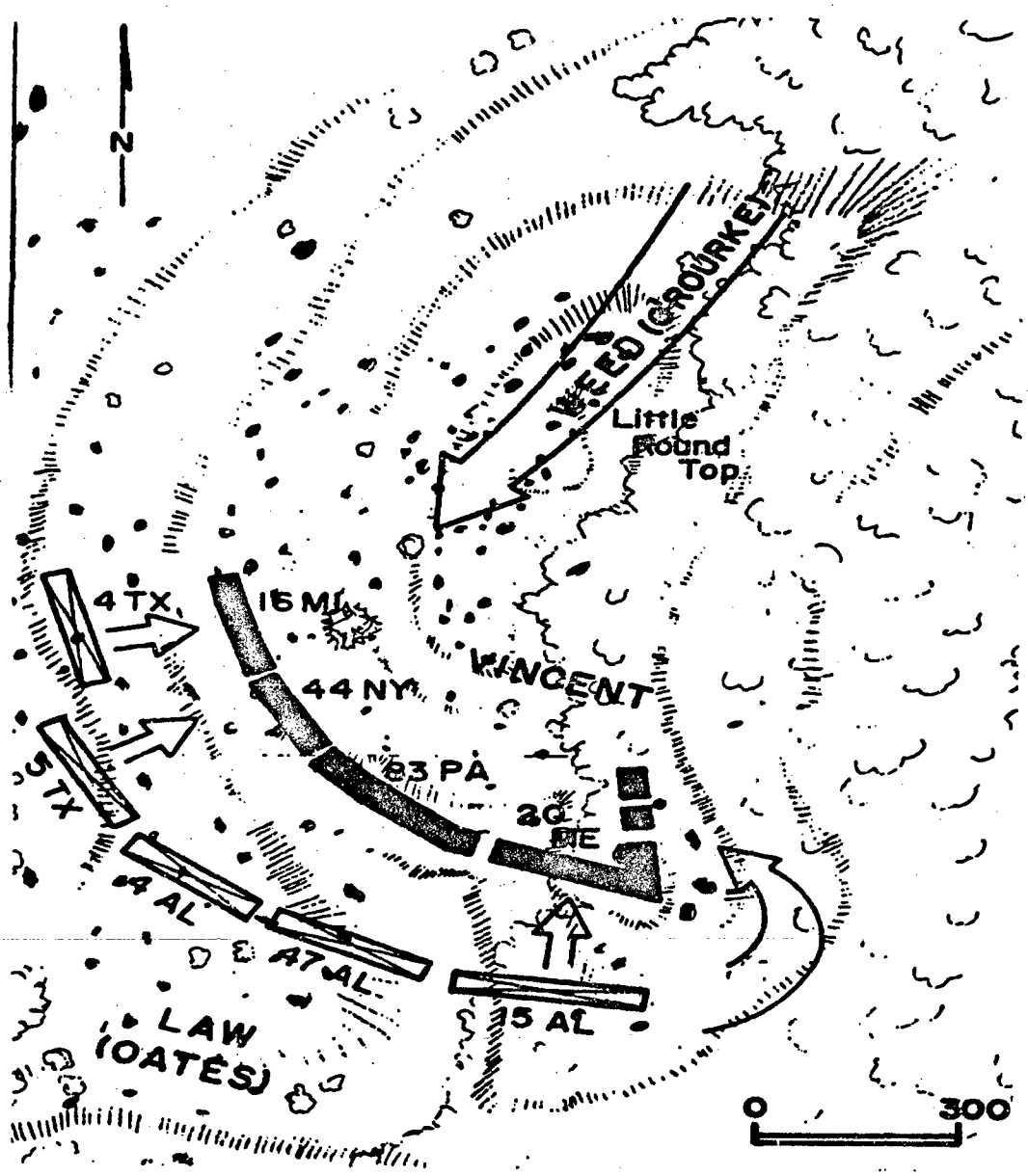


Figure 4.4. O'Rorke's Counterattack

Reprinted from (18)

As the smoke was clearing Chamberlain feared the Confederates would realize how weak he was. There was a short lull in the battle and Chamberlain thought the enemy was preparing to rush his position. The Union soldiers were running out of ammunition. Chamberlain described the scene:

> I saw the faces of my men one after another, when they had fired their last cartridge, turn anxiously towards mine for a moment; then square to the front again. To the front for them lay death; to the rear what they would die to save ... I stepped to the colors. The men turned towards me. One word was enough, — BAYONET! It caught like fire, and swept along the ranks. It were vain to order "Forward". No mortal could have heard it...(4:52–53)

Chamberlain's force of 200 then rushed a force of about 500 men. Although some of the soldiers may have had ammunition left, because they had muzzle loading weapons once they put the bayonet on it would be impossible to reload. The left flank of Chamberlain's regiment wheeled forward to the right, came on line with his right flank then the entire regiment resembled a gate on its hinges as it swept the front of confederates. The 20th Ma took nearly 400 prisoners and many other Confederates fled up the north slope of Big Round Top (4:53).

Years later a man who fought with the 15th Ala wrote to Chamberlain after the war:

> Dear Sir:
> I want to tell you of a little passage in the battle of Round Top, Gettysburg, concerning you and me, which I am now glad of. Twice in that fight I had your life in my hands. I got a safe place between two big rocks, and drew bead fair and square on you. You were standing in the open behind the center of your line, full exposed. I knew your rank by your uniform and your actions, and I thought it a mighty good thing to put you out of the way. I rested my gun on the rock and took steady aim. I started to pull the trigger, but some queer notion stopped me. Then I got ashamed of my weakness and went through the same motions again. I had you, perfectly certain. But that same queer something shut right down on me. I couldn't pull the trigger, and gave it up, that is your life. I am glad of it now, and hope you are. Yours truly (4:52)

The charge of the 20th Ma repulsed the final major assault on Little Round Top. Little Round Top was secure and after the fighting ended the remainder on Colonel Weed's brigade moved in along with Colonel Fisher's Third Brigade of Pennsylvania Reserves. Darkness fell on the battlefield.

4.6 Summary

The battle of Little Round Top represented a crucial point during the battle of Gettysburg. By denying the Round Tops, the Union was now in a position of strength. The additional time gained from the days events enabled Meade to maneuver the entire Union Army into a position where units could reinforce each other. His brigades still occupied Culps Hill, Cemetery Hill, and the Round Tops plus they had ample reserves of men and ammunition (27:438). Additionally, after Meade's council of war that night his corps commanders understood the plan and were in agreement. General Lee's opportunity to win a decisive victory eluded him when he failed to unhinge the Union left at Little Round Top. Lee's only hope rested with his plan for a massive assault on the Union center the following day. That assault would become known as Pickett's charge.

Extraordinary heroics and uncanny timing played a large role in the Union's success in the defense of the Round Tops. Neither could be planned. Although there were heroics on both sides, the defense would not have been successful without the initiatives of General Warren, Colonel Vincent and Colonel Chamberlain. Their efforts made a significant difference to the outcome. The timing of Warren's ascent of the Little Round Top to see the Confederate attack, the initiative of Vincent to occupy Little Round Top without direct orders from his superior or Chamberlain's decision to charge in the face of a larger force directly shaped the battle's outcome. If these events happened an hour, thirty minutes or even fifteen minutes after they actually occurred, no one could be sure the battle would have the same result.

With a firm grasp of the events during the battle of Little Round Top, the research shifted to an investigation of the wargames to explore the "what if" situations and to gain other insights into the battle.

V. *Thunder at the Crossroads*

5.1 Introduction

The purpose of this chapter is to provide the model analysis for *Thunder at the Crossroads*. The analysis will include a description of the model along with the results of the game play in accordance with the research objectives. The description includes a discussion of the model overview, components, rules, sequence of game turns, combat processes, and characteristics. The results of the research objectives will include how well the model replicated the battle, the results of the different "what if" scenarios and a discussion of the insights and issues raised from the model.

5.2 Model Overview

The *Gamers* Inc. produced *Thunder at the Crossroads* in 1988. The game is an aggregated, brigade level, two – sided board game (Union versus Confederates) that simulates the historic battle of Gettysburg. During the game players take on the roles of the Army Commanders, Generals Robert E. Lee and George G. Meade. *Thunder at the Crossroads* is the second in a series of games by the *Gamers* that use the same general game system and rules to recreate Civil War combat (29:1).

Dean Essig, the game designer of *Thunder at The Crossroads* stated that his objective to the game was to provide a combat model to support the command system during the Civil War. Mr. Essig wanted to replicate the "ebb and flow" of combat. Specifically, players could not take their units and pound away straight at their opponent. He wanted players to realize both the necessity and the difficulty of synchronizing their forces at the decisive point on the battlefield. (15).

In addition to having a strong historical foundation, the game's structure provides a readily adaptable format to explore the "what if" type questions as part of the research. Players can choose from several different combat scenarios. Possible scenarios include playing: the entire three day battle, each day separately, a fourth

day, a Stonewall Jackson lives game, and a listing of eight other minor variants to the battle.

5.3 Components

The components of *Thunder at the Crossroads* include:

- 1 series rule book
- 2- 22 X 28 inch maps
- 560 counters
- 2 combat cards
- Loss charts
- 2 order log sheets
- 2 dice

5.3.1 Rule Book. The rule book is in two parts. The first portion describes how to play the game according to the generalized *Civil War* series rules. The second part is specific to *Thunder at the Crossroads.* This portion contains special rules for the game, descriptions of each scenario with initial locations, unit rosters, and order of arrival charts. The rules provide a framework to execute game play. In most cases questions about the rules can be answered by common sense. It is not necessary to memorize the rules, just be familiar with where to find things.

5.3.2 Maps. Two overlapping 22 X 28 inch maps represent the battlefield. The letters A and B identify the maps. The A map contains the northern portion of the battlefield while the B map contains the southern portion. Unlike standard military maps that have grid squares, the map consists of six sided hexes. The distance from the center of one hex to the center of its adjacent hex represents 200 yards. The game uses the hexes to regulate movement and position forces. One can

locate positions on the map much the same way as standard military maps. The numbers for each hex are first read to the right and then up. For example, the hex location B23,15 represents the crest of Little Round Top. The B signifies the southern map sheet. The 23 signifies the vertical column of hexes and the 15 represents the horizontal row. Figure 5.1 is the portion of the game map that includes Little Round Top and its surrounding area.

Each hex contains a certain type of terrain. The map contains sixteen different types of terrain features including: primary and secondary roads, orchards, woods, ridges, and streams. Each type of terrain has a different effect on movement and combat. For example, a unit expends less movement points travelling along a road than moving in the woods. Each grid hex also has a particular color code representing its elevation. The elevations ranged from 430 – 640 feet. Figure 5.2 contains examples of different terrain features and an elevation chart. For example, according to figure 5.1 the location of Devil's Den is B22,26. Devil's Den has woods to the north, and extreme slopes on its east side and southwest corner. The elevation for the Devil's Den hex is 520 feet. The maps provide a realistic representation of the battlefield. The level of detail allowed for accurate placement of units and a good appreciation for the terrain effects on military operations.

5.3.3 Counters. The counters represent the fighting and controlling elements of the game. Players use the counters to represent the movement of forces on the battlefield or to indicate a change in their status. *Thunder at the Crossroads* uses two categories of counters. The primary category of counters represents the maneuver elements while the secondary category reflects any changes.

The primary counters represent the unit, leader, and headquarters elements. Each of the unit counters contain information such as its type organization, formation, combat strength, and morale. The leader counters represent the commanders at division, corps and army level. The headquarters counters mark the center of an

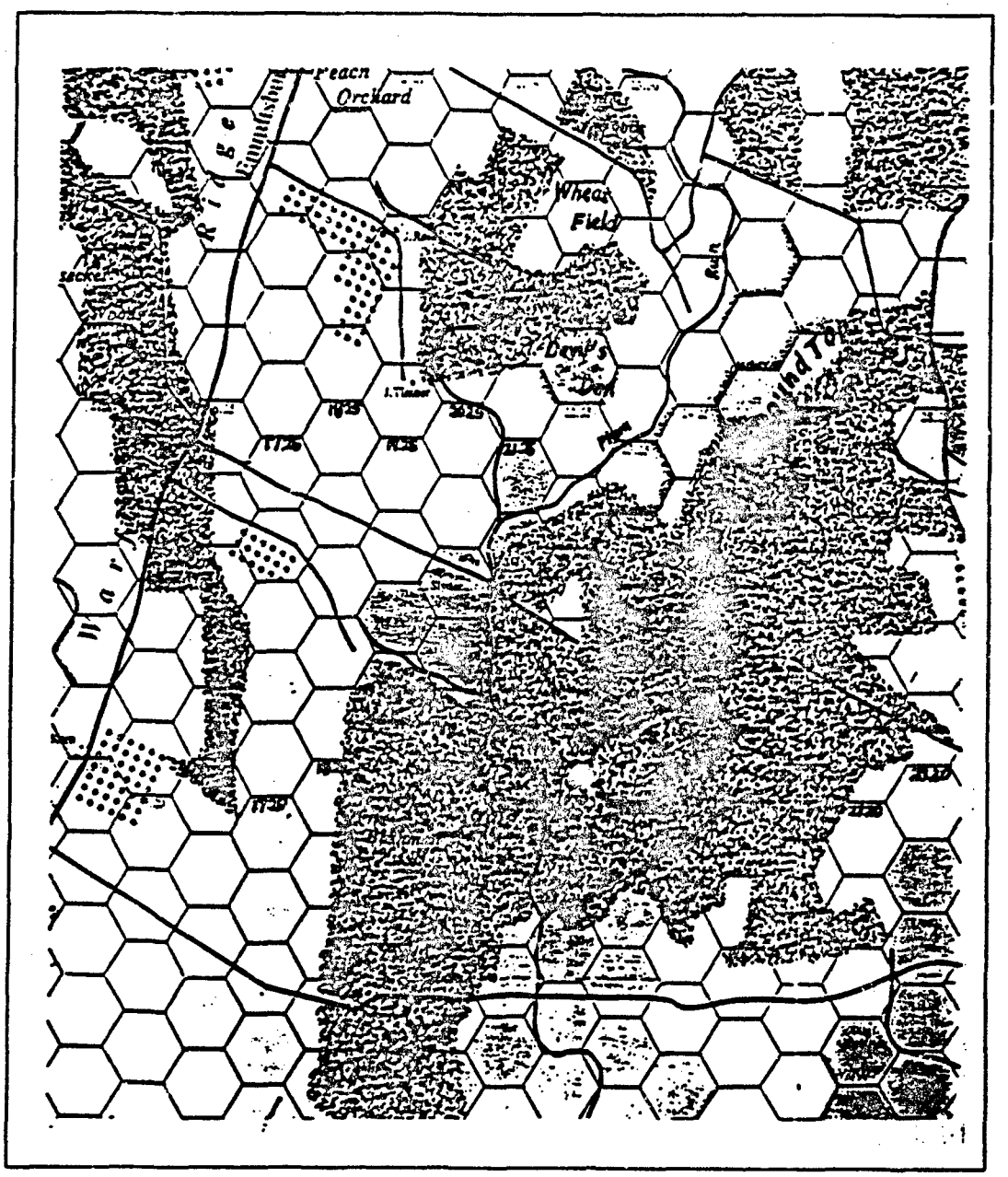


Figure 5.1. Game Map for *Thunder at the Crossroads*

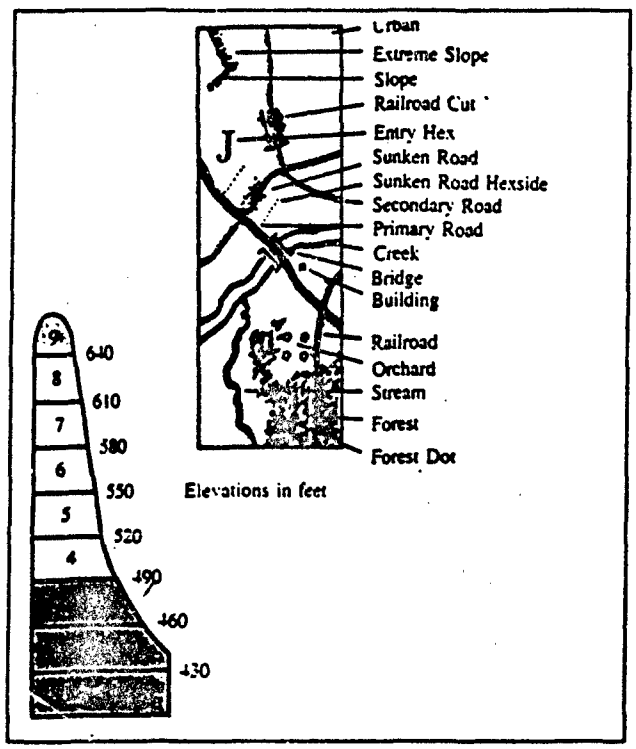


Figure 5.2. Terrain Features and Elevations

organization and have no combat or movement value associated with them (29:4). The following table shows the number and type of primary counters.

Table 5.1. Counter Breakdown for *Thunder at the Crossroads*

TYPE	South	North
Infantry brigades	37	52
Artillery battalions	17	23
Cavalry brigades	7	7
Leaders	14	30
Headquarters markers	4	9
TOTAL	79	121

The front and back of each unit counter depicts the combat and movement formations. The front side of infantry, artillery, and cavalry counters represent line, limbered, and mounted formations while the back side of the counters represent column, unlimbered, and dismounted formations respectively. A unit's formation affects its ability to maneuver and conduct combat. For example, the movement cost for infantry in column to move on roads or up/down slopes is less than being in a line formation. Mounted cavalry can move twice as far as dismounted cavalry. Artillery can move in a limbered status but must change to unlimbered to fire.

Another important element of information on the unit counters are the fire levels for the infantry and cavalry units and gun points for artillery units. The fire level of a unit represents its combat capability. A unit's fire level is an indication of the volume of fire it can deliver (29:10). The initial strengths for each unit determine the fire level. The more soldiers in an infantry unit the higher the fire level. A comparison of the fire levels for the brigades that I played during the Little Round Top scenario is in table 5.2.

The letters have a linear relationship ranging from A to C. One A equals two B's and one B equals two C's (29:6). As a unit suffer losses, its strength decreases which decreases its fire level.

Table 5.2. Unit Fire Levels

Union Brigade	Number of Soldiers Modeled	Fire Level	Confederate Brigade	Number of Soldiers Modeled	Fire Level
Ward	2200	AAB	Anderson	1900	AA
Vincent	1300	AB	Benning	1400	AB
Weed	1500	AB	Law	1900	AA
Fisher	1600	AB	Robertson	1700	AA

An artillery unit's strength is in terms of gun points. Each gun point represents 3 cannons regardless of type. The maximum number of points an artillery unit (battalion) can have is 5 gun points. Artillery units can be detached to represent artillery batteries. Players subjectively assign battery gun point strengths ranging from 1 - 3 gun points. The sum total of gun points for the detached batteries can not be greater than 5 gun points.

The final element of information on a unit's counter is its morale. Unit morale ranges from A to E. A morale is outstanding, C average and E poor. Morale levels represent the effects of leadership, experience, and the small group dynamics within a unit and did not change during the game. The game models changes to morale due to combat by varying morale states. The different morale states are blood lust, normal, shaken, disorganized, and rout. Each unit starts the scenario in the normal state.

The second category of counters represent changes in state of the primary counters. Types of secondary counters include degraded morale, combat strength, and extended lines. The secondary counters are placed underneath the primary counters (except in the case of extended lines which is to the flanks). Figure 5.3 shows examples of the various counters used in Thunder at the Crossroads.

5.3.4 Combat Cards. The combat cards contain the combat tables. The tables resolve issues based on unit characteristics and dice rolls. Table 5.3 contains a listing and description of each table.

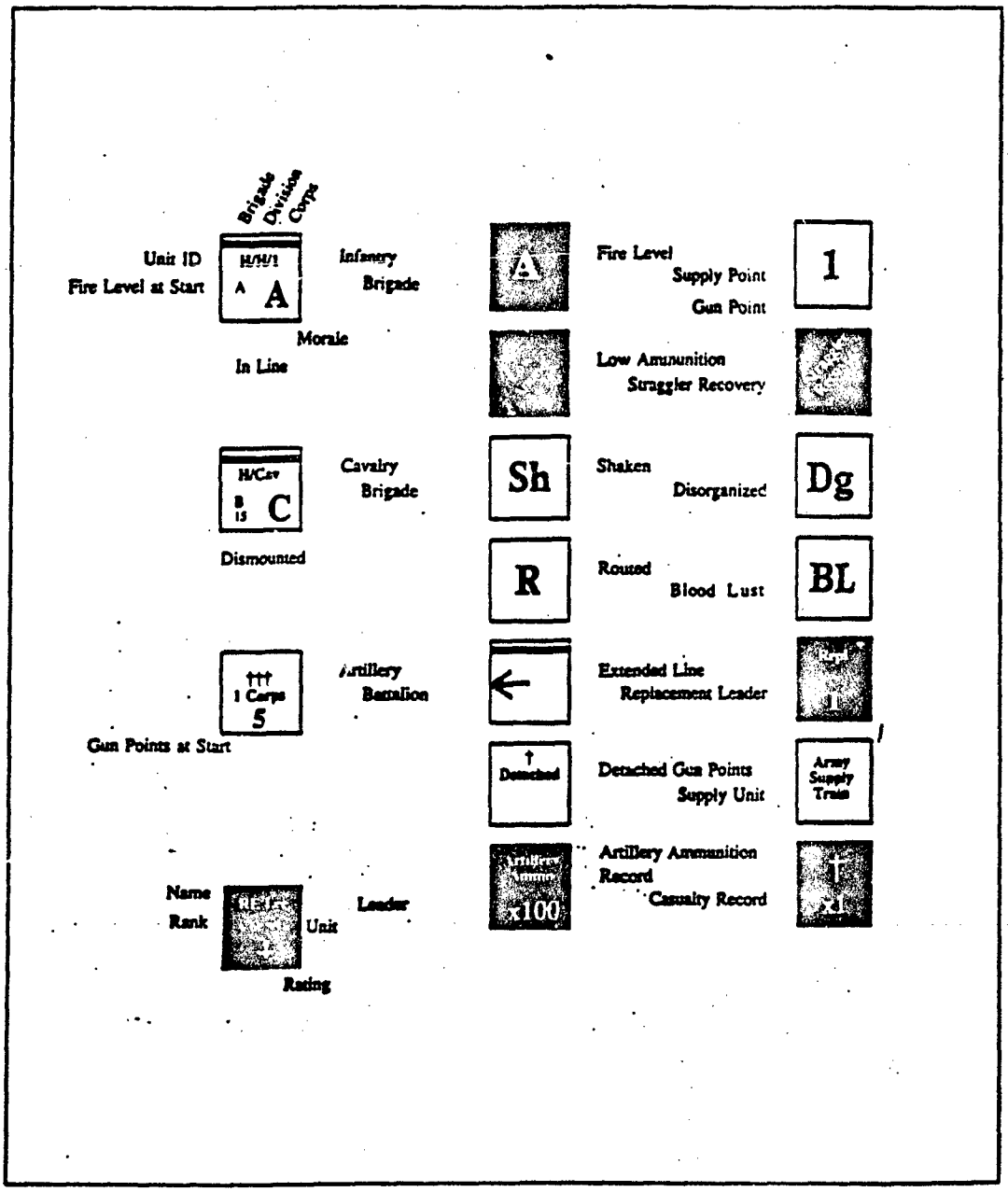


Figure 5.3. Counter Types

Table 5.3. Tables for *Thunder at the Crossroads*

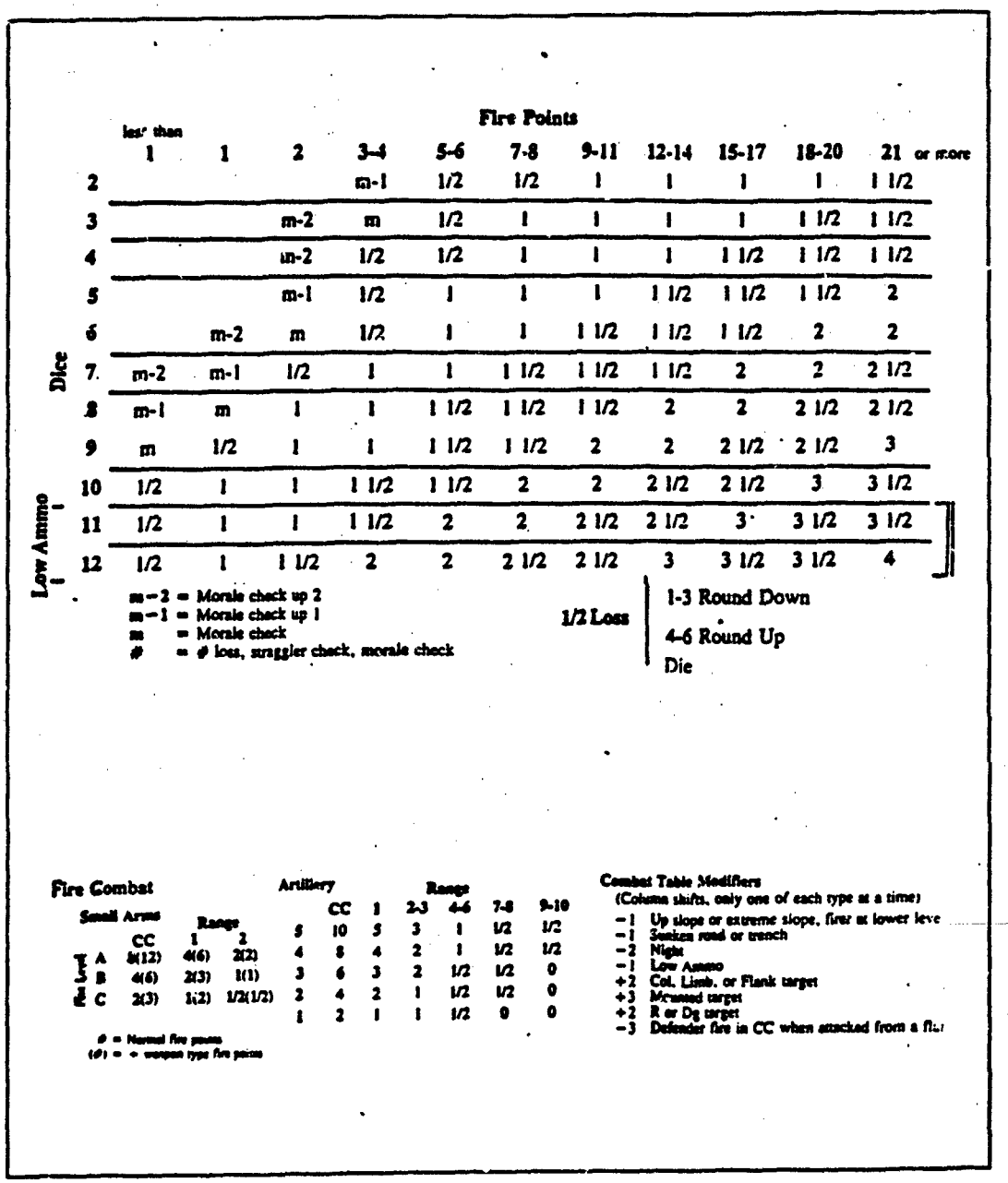
Type	Description
Combat Results Tables	Determines loss of strength points based upon range, number of fire points, and combat modifiers.
Morale	Determines the change in a unit's morale status and any effect on position (retreat) or strength (straggler loss).
Stragglers	Determines the number of stragglers lost based upon the loss of strength points from fire combat and morale. The greater the fire loss, the greater the number of stragglers.
Leader Loss	Determines the loss or wounding of a leader as a result of combat. Dice roll of 2 (.028 chance) kills the leader, rolls of 11 or 12 (.084 chance) wound him.
Gun Loss	Determines the loss of gun points for artillery limbering or retreating out of a zone of control. Results of one die rolled: 1 or 2, 0 gun points lost; 3 or 4, 1 gun point; 5, 2 gun points; and 6, 3 gun points.
Corps Attack Stoppage	Determines if corps attack continues or stops. Conducted each turn after first rifle combat.
Close Combat Odds	Determines the result of close combat based on strength points and combat modifiers.

The most important table in the game is the Combat Results Table. The Combat Results Table drives all battle outcomes. Figure 5.4 contains the Combat Results Table with fire level determination chart and modifier list. The column headings of the Combat Results Table are the fire points. The row headings are the dice roll results. After the dice roll, you look for the result by reading across the row to the corresponding fire point column for the engagement (after modifiers) and the intersecting number is the combat result. For example, based on the dice roll and fire points, the possible results would range from no effect to a result of 400 casualties (before straggler and leader loss rolls).

The following example of an extended line of Law's brigade firing at an extend line of Vincent's brigade will illustrate how to use the Combat Results Table along with the possible range of results. The extended line is a term used in the game to represent a brigade changing to a line formation and then spreading out laterally. A unit may extend its line in one or both directions. For example, Vincent's brigade could occupy a 200 yard front (1 hex) with 1300 soldiers, a 400 yard front (2 hexes, 650 soldiers per hex), or a 600 yard front (3 hexes, about 430 soldiers per hex). When a unit extends lines the fire levels must be divided as evenly as possible between the unit marker and the extended line(s) (29:6).

In this example, Vincent's brigade, fire level AB, extends its line one direction when it occupies Little Round Top. When Vincent's brigade extends its line in one direction, the extended line has a B fire level while the parent unit maintains an A fire level (the brigade's fire level is divided as evenly as possible). Law initially has an AA fire level, therefore when this unit extends its lines in one direction the result is two A fire level units. In this example, Law's extended line (fire level A) fires at Vincent's fire level A marker. During fire combat, one side will fire and the casualties are assessed before the other side returns fire.

To model Law's extended line firing at Vincent's, the first check to make is on the range table. For this example, the Confederate unit is 1 hex away. The A fire



Fire Points

Dice	less than 1	1	2	3-4	5-6	7-8	9-11	12-14	15-17	18-20	21 or more
2				m-1	1/2	1/2	1	1	1	1	1 1/2
3			m-2	m	1/2	1	1	1	1	1 1/2	1 1/2
4			m-2	1/2	1/2	1	1	1	1 1/2	1 1/2	1 1/2
5			m-1	1/2	1	1	1	1 1/2	1 1/2	1 1/2	2
6		m-2	m	1/2	1	1	1 1/2	1 1/2	1 1/2	2	2
7	m-2	m-1	1/2	1	1	1 1/2	1 1/2	1 1/2	2	2	2 1/2
8	m-1	m	1	1	1 1/2	1 1/2	1 1/2	2	2	2 1/2	2 1/2
9	m	1/2	1	1	1 1/2	1 1/2	2	2	2 1/2	2 1/2	3
10	1/2	1	1	1 1/2	1 1/2	2	2	2 1/2	2 1/2	3	3 1/2
11	1/2	1	1	1 1/2	2	2	2 1/2	2 1/2	3	3 1/2	3 1/2
12	1/2	1	1 1/2	2	2	2 1/2	2 1/2	3	3 1/2	3 1/2	4

Low Ammo

m-2 = Morale check up 2
m-1 = Morale check up 1
m = Morale check
# = # loss, straggler check, morale check

1/2 Loss
1-3 Round Down
4-6 Round Up
Die

Fire Combat

Small Arms

Type	CC	Range 1	Range 2
A	8(12)	4(6)	2(2)
B	4(6)	2(3)	1(1)
C	2(3)	1(2)	1/2(1/2)

= Normal fire points
(#) = + weapon type fire points

Artillery

CC	Range 1	2-3	4-6	7-8	9-10
5	10	5	3	1	1/2	1/2
4	8	4	2	1	1/2	1/2
3	6	3	2	1/2	1/2	0
2	4	2	1	1/2	1/2	0
1	2	1	1	1/2	0	0

Combat Table Modifiers
(Column shifts, only one of each type at a time)

−1 Up slope or extreme slope, firer at lower leve
−1 Sunken road or trench
−2 Night
−1 Low Ammo
+2 Col. Limb. or Flank target
+3 Mounted target
+2 R or Dg target
−3 Defender fire in CC when attacked from a fl...

Figure 5.4. Combat Results Table for *Thunder at the Crossroads*

level at a range of 1 has 4 fire points. Normally you then find the column with the 4 fire points on the results tables but according to the combat table modifiers, a -1 column shift (to the left) occurs when the firer is at a lower level. The new column of interest is then under the 2 fire points column.

The dice roll then determines the possible outcome. A dice roll of 2 has no effect on either side. A dice roll between 6 and 3 indicates the attacker must use the Morale Table to determine the result. M-1 and M-2 indicates the attacker finds his unit 's morale level on the Morale Table (B in Law's case) then drops the appropriate rows (in this case 1 or 2) another dice roll determines the change of morale state. Law's results could range from no effect to being routed, forced to retreat, and incurring 150 stragglers.

If a player, representing Law, rolls a 7, the 1/2 loss indicates the player then rolls 1 die. If the result of the die is 1,2 or 3 nothing happens. If the die is 4,5 or 6 then a casualty of 1 (representing 100 soldiers) occurs to Vincent. Dice roll results of 8, 9,10, and 11 result in 100 casualties. A dice roll of 12 results in at least 100 casualties. The 1/2 signifies the player must roll again similar to when the 7 was rolled. If a 4,5, or 6 is rolled Vincent brigade suffers 200 casualties.

In this example there are 37 possible outcomes when Law fires at Vincent if you only count the initial roll to determine the result on the Combat Results Table and the results of rolling again if the attacker must use the Morale Table. Rather than enumerate all 37 possible outcomes, Table 5.4 illustrates the broad range of possible outcomes.

Whenever a defender incurs a loss, he must roll again to determine leader loss, straggler loss and changes to morale. In this case those rolls could lead to additional losses in Vincent's brigade of: losing the commander, retreating 2 hexes and a total straggler loss of 350 soldiers. The results of any particular battle outcome is quite complex and can have a very wide range of possible outcomes.

Table 5.4. Possible Battle Outcomes from Law Extended Versus Vincent's Extended Line

Initial engagement	Probability
Law retreats 2 hexes and loses 150 stragglers	.01
Law is disorganized, retreats 2, loses 100 stragglers	.01
Law is disorganized retreats 1 hex	.02
Law is shaken retreats 1 hex	.04
Law changes morale state stays put	.09
No effect to either side	.33
Law inflicts 100 casualties	.49
Law inflicts 200 casualties	.01
TOTAL	1.00

When you consider that Law can engage Vincent twice per game turn (half hour of game time), you get an idea of the lethality of the game.

5.3.5 Loss Sheets. Players record troop losses by brigade on the loss charts. There is one loss chart for the Union player listing all the Union brigades while the Confederate player has one listing all the Confederate brigades. A typical brigade line may look like:

L/Hd/1 B 19 AA 000 AB 00000 A 00—000 B 000 C 000

This line represents Law's brigade of Hood's division from I Corps. The B is the initial morale state. 19 is the strength level corresponding to the number of soldiers in the brigade (19 X 100 soldiers). The "0's" represent 100 soldiers of the brigade (thus 19 O's). The letters between the 0's represent decreasing fire levels for the brigade as it suffers casualties.

As casualties occur players cross out the "0's from left to right with an X. If stragglers occur a / is used. For example, if Law's brigade suffers 400 casualties the first four 0's are crossed off and the unit fire level drops from AA to AB. The horizontal "—" represents the point where the brigade is "wrecked" (the game turn used to define a brigade that has substantial morale and straggler modifiers).

Most brigades become wrecked if they suffer between 40 - 60 % casualties. The game's designer based the determination of the intermediate value, "—", on his own subjective opinion on how the brigade performed in the battle. Some allowances were made for units that performed extraordinary efforts. For example, in the game the Iron Brigade does not become wrecked until it is at 28% strength.

Once a brigade is wrecked, a mark is made on the division line. The division becomes wrecked once all the ovals to the left of its wrecked line are filled (29:8). The chance of the Corps breaking off an attack increases as the number of its divisions become wrecked.

Brigades may become unwrecked by recovering stragglers. Divisions may become unwrecked by the recovery of its brigades.

5.3.6 Order Log. The Order Log is a sheet players use to record combat orders. The purpose of the order log is to check the status of orders at any given time. Players must maintain the log with care to avoid mistakes in order delivery. The order log consists of the following information:

a. The order's number
b. Arrival time
c. Receiver
d. Sender
e. Order type
f. Method
g. Force Level
h. Acceptance

Thunder at the Crossroads uses an intricate orders process designed to create an atmosphere representative of the difficulty and confusion of the real life orders process confronting the Civil War leaders. The design of the orders process is to

instill some of the uncertainties in issuing orders and having them carried out due to "fog of war" events. One can play the game without using the orders process. Although the game plays quicker, you lose the flavor of the game. I will first describe the general flow of the orders process in the game then discuss each step in detail. This method will help explain the order log and its column headings (a – h).

The orders process begins when a player (portraying the Army commander) issues orders to his corps commanders. The orders are delivered to the corps commanders either in person or via courier. Then acceptance checks are made. If the orders are accepted, the orders are acted upon in good faith even if the game conditions changed. Orders may be cancelled by other orders or by using initiative. Initiative may be used to issue orders also. The spirit of the rules is to keep a player from instantly reacting to changes in the game in a perfectly coordinated fashion. This situation is common in wargames but impossible in real life (29:2).

In the game, each army, corps and division commander has a leader rating. The leader rating determines the number of command points available to issue orders. For example, in the game the following leaders have the associated leader ratings:

Table 5.5. Leader Ratings

Confederate	Union
Lee: 4 (2 for orders issue)	Meade:3
Longstreet:4	Sickles:1
Hood:4	Sykes:2
	Barnes:1
	Ayers:2
	French:2

Each leader rating constitutes a certain number of command points: leader ratings of: 4 and 3 have 15 points, 2 and 1 are 10 points, and 0 is 8 points.

Players write orders using these command points. The command points may not be saved from turn to turn. A player can issue as many orders as desired provided the number of command points issued does not exceed the command points available.

The following paragraphs summarize the options available to players during the orders formulation process. The options are in the categories of the type, form, method of delivery, and force for each order.

Players issue two types of orders; complex and simple. Complex orders cost 3 command points and are for more elaborate combat operations such as assaults and flank marches. A complex order includes directions for movement to, into, or around areas of enemy control or tacit control (a gap) whether or not the action requires combat. On the other hand, simple orders cost 1 command point and are for more routine functions such as line creation, defensive operations and movement of troops in rear areas. The orders must be followed as close as possible (29:3).

Although there is no strict format to the orders, all types of orders must include:

- The orders number (the line of the order according to the order log)
- Sender
- Receiver
- Order type
- Time sent

A complex order also includes:

- Start time or signal
- Axis
- Limit: a reasonable stopping point of the operation. Open ended orders such as attack east are not allowed. The orders must have an attainable end point.

An example of a complex order is:

1. Complex Hood Law 12:30 Attack at 4:00 east to seize Little Round Top.

This example has an order number of 1, is a complex order from Hood to Law. The time of the order was 12:30. The order is to begin the attack at 4 pm game time and seize Little Round Top.

Some operations not requiring orders are: fire and close combat, straggler recovery, rally, supply trains and wagon functions, artillery functions, and movements of units not requiring headquarters movement.

Players can choose the form of the order. The form of the order can be either oral or written. Oral orders cost 2 command points whereas written orders cost 5 command points (all orders in the game are written for record keeping).

Orders may be delivered in person or by courier. The courier may deliver oral or written orders. Players calculate the amount of time necessary to deliver the orders based on movement points of the commander issuing the order. Each leader has a movement allocation of thirteen movement points per turn. The number of turns required for the leader to move to a location to deliver the orders determines the game turn the orders go into affect. The courier has only ten movement points per game turn. The difference between the commander and the courier's movement points presumes a commander would be able to move quicker on the battlefield. Each method type effects the acceptance probability. For example, an order given in person has a higher probability of acceptance than one delivered by courier.

Another choice a player has is the force of the order. Force is the amount of emphasis the commander places in the order depending on how it is phrased. Force is given as a value of 0 (if opportunity permits) to 2 (DO IT NOW!) with the greater the value the greater the force of the language.

An example of Lee issuing orders to his corps commanders illustrates how the order point system works. Lee had a leader rating of 4 but for orders issue he had a 2

rating. The 2 leader rating translated into only 10 command points. Lee did not have enough command points to issue a written (cost of 5), force 2 (cost of 3), complex (cost of 3) order. If Lee wanted to issue orders to his three corps commanders in one game turn, he would have to issue oral (cost 3), low force (0), simple type orders for a total of 9 command points. Lee's leader rating for the game captured his method and style of orders to his commanders.

The final entry in the order log is acceptance. Acceptance is a measure of the quickness of reaction by the receiver of an order. Accepted orders must be acted upon to the best of the ability of the person receiving the order regardless of the circumstances. Acceptance levels can range from acceptance, delay one turn, delay indefinitely (depended on die rolls during subsequent turns), or the order can be lost. The acceptance of an order is a function of both the sender and receiver's rating, method, force, and type. Not surprisingly, a simple forceful order given in person between two high rated leaders had a better chance of acceptance than a complex order between two low rated leaders sent by courier. For example, Lee's order to Longstreet to attack on 2 July would have had an acceptance rating of: Receiver rating (4) + Sender rating (2) + in person (2) + force[1] (low: -1) + type[2] (complex: -2) = 5

According to the Acceptance Table, the probabilities of Longstreet's acceptance to the order are:

- .028 Throw away
- .084 Delay indefinitely
- .388 Accept
- .445 Delay 1 turn

[1]In the acceptance equation, a low level of force is -1, a medium level force is 0, and a high level of force is +1.

[2]In the acceptance equation, a complex order is -2 and a simple order is 0.

The high probability of any type of delay is indicative of Longstreet's historical reaction. Many feel Longstreet dragged his feet throughout the day before attacking.

5.3.7 Dice. The game uses a pair of six sided dice. Players roll the dice and use the results in conjunction with the tables to determine the outcome for all actions.

5.4 Rules

The rules are in two parts. The first part is a generic set of rules the designers use for a series of games produced concerning Civil War battles. The second set of rules outlines the peculiarities of *Thunder at the Crossroads*. The basic design of the rules contain a framework to restrict players to the historical conditions of the battle of Gettysburg. Playing the game according to the rules gives each player a feel for the essence of Civil War combat and an appreciation for the importance of the timing of the events during the battle. The rules are thorough in the description on how to play but at times confusing for a novice. The rules in the earlier editions of the game contain errors which necessitated several calls to the designer for clarification. This did not ease the learning process.

Along with the generic *Civil War, Brigade Series* rules, *Thunder at the Crossroads* has special rules peculiar to the game. The Union has three special rules (29:3). The first provides an order of rank for the corps commanders to take charge of the Army before General Meade arrives on the battlefield or in case Meade becomes a casualty. The second rule gives the Union player unlimited supply of artillery ammunition although the player must still be subject to supply wagon location rules. The rule reflects the fact the Union had interior lines which provide easy access to supply points. The third special rule gives all Union cavalry units increased fire power points compared to other units at the same ranges. The increase was 50% in some cases. This reflects the use of the breech loading rifles, predominately Burnside

and Sharps carbines, which had a high rate of fire (6:206). To model this advantage during combat, the Union cavalry units used the numbers in parenthesis on the Fire Combat chart (Figure 5.4).

The Confederates also have three special rules. The first rule allows divisions to operate outside normal command radii. This allows divisions to execute maneuvers such as flank attacks. The second rule decreases Lee's rating as a leader in the order's process. This could be open to some historical debate. Some might say this shows the poor orders process Lee had during the battle of Gettysburg. Others would say this takes into account the inexperience of Lee's corps commanders. During the battle two of Lee's three corps commanders were new to their jobs. The final special rule gives the Confederates an additional General, Issac Trimble, to use as a replacement for any killed or wounded division commander.

5.5 Description of Game Play

Game turns compartmentalize the game into segments representing 30 minutes of historical time. Within each game turn, players alternate "player turns". Each player turn consists of a series of steps that each player follows in sequence. The sequence must be followed exactly because the relationship of the steps supports the overall game objectives (15:2). The following outline is the game sequence for *Thunder at the Crossroads*:

Thunder at the Crossroads Game Sequence

1. FIRST PLAYER TURN

   (a) Command Phase

      i. Panic roll demand if desired

      ii. Order issue

      iii. Corps attack stoppage check

iv. Delay reduction

v. New order acceptance

vi. Initiative determination if desired

vii. Initiative orders

(b) Movement and Close Combat Phase

i. Straggler recovery marker placement

ii. Movement and close combat

iii. Ammo resupply

(c) Fire Combat Phase

i. Enemy fire combat

ii. Friendly fire combat

(d) Rally Phase

i. Straggler recovery and marker removal

ii. Rally

2. SECOND PLAYER TURN

(a) Repeat steps from above

3. GAME TURN END PHASE

(a) Status change phase

(b) Game turn marker advance

The general flow of each turn begins with the command and control process when players issue orders. The Confederate player conducts movement. The defender is always the first to fire followed by the attacker and then consolidation and reorganization. Since the defender fires first, the casualties he inflicts on the attacker are taken into account prior to the attacker firing. The other player then begins his

turn. A detailed discussion of particular phases will be included in the Combat Processes Section.

A set of victory conditions determine the winner and loser at the end of each game. Each scenario outlines its own set of victory conditions. The victory conditions are based on a system of victory points awarded for seizing key terrain or inflicting a certain number of enemy casualties. Terrain features such as: Little Round Top, Cemetery Hill, entry and exit hexes, etc., are worth victory points to the owner at the end of the game. The more valuable the terrain towards victory, the higher the victory points. Players also acquire victory points by wrecking his opponent's brigades. Players accrue additional victory points through wrecking over 30% of the brigades of any given corps.

The scenario victory conditions provide a range of values that determine a victory level. The six victory levels range from a massive, major, then minor victory for one side, to a minor, major then massive victory for the opponent. Players determine the victory level by adding their respective victory points and then subtracting the Union total from the Confederate total to produce a single value (29:2). Some scenarios have specific conditions that if either side achieves, triggers a certain victory level.

For Example, in the Little Round Top scenario, the Confederates achieve a major victory if they seize both Little Round Top and Cemetery Hill. Otherwise, the Union player subtracts his total from the Confederate total to determine a victory level.

5.6 Combat Processes

This section discusses the techniques used in *Thunder at the Crossroads* to simulate the combat processes of command and control, movement, combat, and combat service support. An analysis of the combat processes of a model provides insights into how well the basic assumptions of the model contribute to its ability

to replicate (or failure to replicate) the actual battle. Another important reason to analyze the combat processes of each model is to avoid a possible mistake of drawing a conclusion about a particular driver in the battle which may not be from the historical situation but rather an inevitable outcome produced by the model's basic assumptions. I will discuss how the model simulates each process, the effects it has on the other processes, and the strengths and weaknesses for each. I will discuss the command and control process first.

5.6.1 Command and Control. The command and control system used in *Thunder at the Crossroads* is outstanding. Although one can find faults with any system, the game accomplishes the designer's objective. The game designer, Dean Essig, developed the command and control system to put historical time lags and confusion into the leadership roles (15). The game forces players to think and plan but at the same time to react to unexpected events. Players can get that unique feeling of seeing how a simple plan on paper can go totaliy awry.

The command and control system centers around the orders process, initiative, and the control of units. A discussion of the orders process was in section 5.3.6; Components, Order Log. Therefore, the remainder of this section will discuss initiative, the method of unit control and the strengths and weaknesses of the command and control process used in *Thunder at the Crossroads.*

One very important intangible during the battle of Little Round Top was initiative. The initiative of leaders such as General Warren or Colonel Vincent or Colonel Chamberlain were crucial to the success of the Union forces on Little Round Top. *Thunder at the Crossroads* attempts to incorporate this important soldierly quality into the game play.

Corps and division commanders may use initiative to get orders for their units. To determine if a commander can use his own initiative, a player uses the commander's leader rating and then subtracts the anti – initiative ratings for all the com-

manders in the chain of command above him. The result is then compared to one die roll. If the die roll is less than or equal to the initiative result number, the leader may use his own initiative.

The following example illustrates how a player would model General Longstreet using his own initiative to flank Little Round Top. A player first takes Longstreet's leader rating (4) and subtracts General Lee's anti – initiative rating (2) to obtain a result of 2. The player rolls one die and if the result is less than or equal to 2, Longstreet may issue the orders.

There are three types of control used for units below corps level: command radii, divisional goals, and orders from Army headquarters. Regardless of the type of control, a unit cannot violate corps orders (29:2).

The command radius is a limitation imposed on corps and division units in order to maintain control over their subordinate units. Command radii works on the premise that if a unit is within a certain distance from the leader, the leader can effectively control his subordinate elements. For example, brigades must be within 4 leader movement points of their division commander. In an open field this would be 800 yards. If the division commander could move to one of his brigades by a road, the radii extends to 1600 yards. To determine effective command radii one must count only the terrain the leader can pass through. Impassable terrain or terrain occupied by an enemy force cannot be counted. Brigades that end up out of the radius must use all of their movement points to move back to their division commander.

The second type of control of units is divisional goals. Divisional goals allow a unit to move outside its normal command radii restrictions as long as their action supports corps orders.

The third type of control placed on a unit is orders from Army headquarters. Army orders to divisions supersede all corps orders.

The command and control process used in *Thunder at the Crossroads* has several strengths. The rules provide a framework for players to develop plans and have subordinate units carry them out. Changes to plans due to various events and changes in the situation force a player to think and react. A player gets a very good feeling of the difficulties involved in command of units.

The biggest weakness to the command and control process is its complexity. The process takes a long time to incorporate into each game turn. One must understand the rules of the game otherwise it is very easy to get bogged down attempting to follow the process. The game can be played without it, however the players sacrifice the real essence of this particular game.

5.6.2 Movement. Players move the counters to represent the movement of the actual forces. Each unit has a standard movement allowance per game turn based on the type of unit and the formation. The movement costs per hex depend on the type of terrain in the hex. For example, an infantry unit in column has 6 movement points. The unit can move 2400 yards on a road (1/2 point per 200 yards) per game turn (half hour) but only 600 yards in the woods (2 points per 200 yards) during the same time period. Changing infantry formations, mounting/ dismounting cavalry and limbering/ unlimbering artillery costs movement points and effects the unit's ability to move. For example, an infantry unit changing from a line formation to a column or vice versa will incur one movement point cost. Artillery units incur a movement cost of three points when changing formations from limbered to unlimbered or back again.

Two other important game characteristics that affect a unit's ability to move are zones of control and stacking. A zone of control represents a unit's ability to control enemy movement in the area around it. All infantry in line formation, cavalry, and unlimbered artillery have zones of control. A unit's zone of control only extends into the adjacent hexes to the unit's front. The front of a unit can cover either three

hex sides if the unit faces a side of the hex it occupies or two hex sides if the unit faces a corner. Any unit that moves into an enemy zone of control must stop all movement regardless of remaining movement points. Players may move out of the enemy's zone of control provided the first hex they move to is not a zone of control for another enemy unit.

Units also have the ability to stack. Stacking means that more than one unit can occupy the same hex. Units do not incur additional movement costs when they stack or unstack. The top unit of a stack is the target for all combat and morale results. There are certain restrictions that affect a unit's ability to stack with other units. First, no more than 3 A fire levels and 10 gun points may stack in a hex at a time. For example, two AB units can stack (AB + AB = AAA (2 B's = A)). However an AB unit cannot stack with an AA unit (result is AAAB). Second, the game limits the amount of firepower a stack can use during combat to 1 A fire level for infantry units or 5 gun points for artillery units. The limits model the effects of one infantry unit of between 700 - 1000 men or one artillery battalion from a 200 yard front. The game models the density of men and equipment a little greater than what normally occurred during Civil War combat. According to *Arms and Equipment of the Civil War*, an infantry unit of 700 - 1000 men would cover a front between 250 - 330 yards while only about 7 artillery guns could occupy a 200 yard front (6:21,71).

The variable movement rates depending on the unit and its formation reflected the historical limitations and conditions. However, the movement process does not accurately model the tendency of a unit in the attack to move faster. For example in the game Law's and Robertson's brigades moved to Little Round Top in 1 1/2 hours whereas most historical accounts place their movement time in about 45 minutes. The discrepancy of times suggests that units in the attack should be allotted more movement points.

5.6.3 Combat. *Thunder at the Crossroads* models two types of combat, close and fire combat. Close combat is an attempt to fight and occupy the defenders territory (hex). Fire combat occurs versus forces at a distance. In all combat situations, the defender always fires first.

To initiate either fire or close combat the attacker must satisfy three prerequisites: the target must be in range, there must be visibility to the target, and there must be line of sight to the target. The range check is simply made from the range tables (shown in figure 5.4). The maximum range for all small arms fire is 400 yards while artillery can fire out to 2000 yards. Degradation occurs as range increases and fire levels and artillery gun points decrease.

The second prerequisite to firing is that visibility exists between the attacker and defender. Visibility is a set number of hexes given as part of the game turn representing the maximum distance that a firer can see. The purpose of the visibility numbers are to model the limiting aspects of early morning and darkness. The visibility per game turn is on the turn number record. During daylight hours there are no visibility restrictions. However, during the 7:30 pm game turn the visibility reduces to 1600 yards (8 hexes), and at 8:00 pm reduces further to 600 yards (3 hexes). Units cannot engage in combat between the hours of 8:30 pm and 3:30 am. At 4:00 am visibility increases to 600 yards then at 4:30 increases again to 1600 yards. Beginning at 5:00 am visibility restrictions cease.

The third prerequisite to firing is line of sight. Players measure line of sight as a line drawn from the center of the firer's hex to the center of the defender's hex. If there are no obstructions line of sight exists and the unit can fire. Obstructions to line of sight include: higher elevations between forces, woods or orchards add 1 elevation level. The firer can shoot into a woods or orchard hex but not through them. Also, the direct fire weapons of infantry or cavalry units cannot fire through another friendly forces hex in order to engage the enemy. However, artillery can fire over a friendly unit.

Fire Combat

Fire combat is the action to inflict losses on the enemy. A unit can conduct fire combat against an enemy unit provided that the enemy is within the visibility index for the game turn, line of sight exists, and the enemy is within range. Section 5.3.4 provided a description of the fire combat process. Figures 5.5 – 5.7 contain a flowchart summarizing the fire combat process.

Close Combat

Close combat is a combination of fire and movement. Close combat models a very close (100 – 150 yards), short, bloody, sluggfest (29:7). Although close combat occurs in the defender's hex it is not meant to model hand – to – hand combat. The results of close combat cause one or both sides to retreat.

Several restrictions to close combat exist, two of the most important are: first, only infantry in line and mounted cavalry may conduct close combat. Second, no more than an A fire level and 5 gun points may fire on each side during close combat (prevents overstacking). The odds favor the defender during close combat. If the defender's fire level is double the attacker's, the chance of a successful defense is .83. The chance of a successful defense decreases to .79 when the defender's fire level equals the attacker's. If the attacker's fire level is three times the defender's, there is a 50/50 chance either side may win.

The strength of the combat process used in *Thunder at the Crossroads* is that the game forces each player to think like a commander. The player must plan his attack and concentrate his fire power at the decisive point to maximize his chance of success. At the same time however, the wide range of outcomes generates the "fog of war" problems than can go with any mission. The game provides a very good framework to understanding the difficulties of command.

5.6.4 Combat Service Support. Logistical planning of ammunition and personnel played an important role in the game. To simulate ammunition resupply,

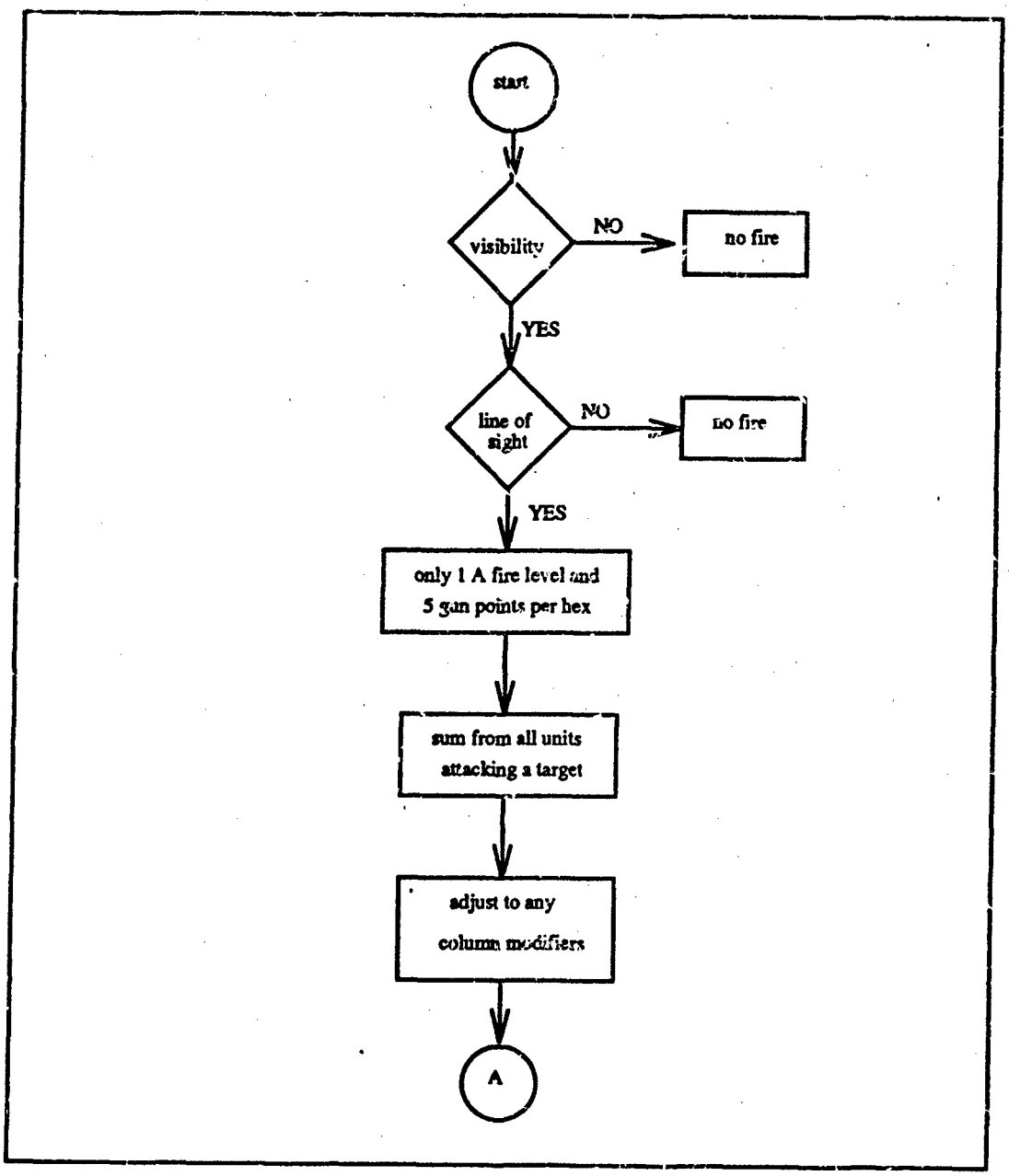


Figure 5.5. Flowchart for Fire Combat

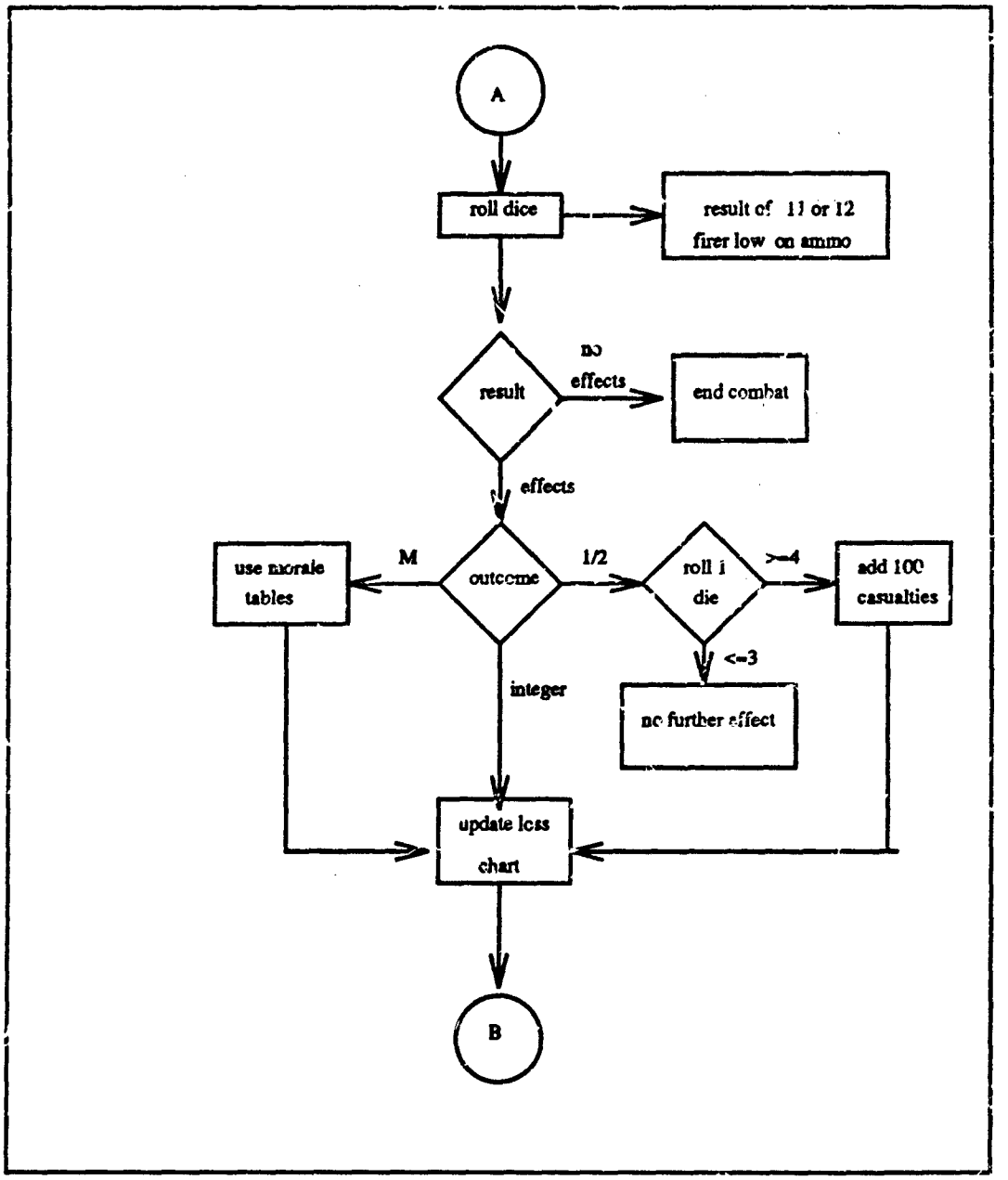


Figure 5.6. Flowchart for Fire Combat (cont)

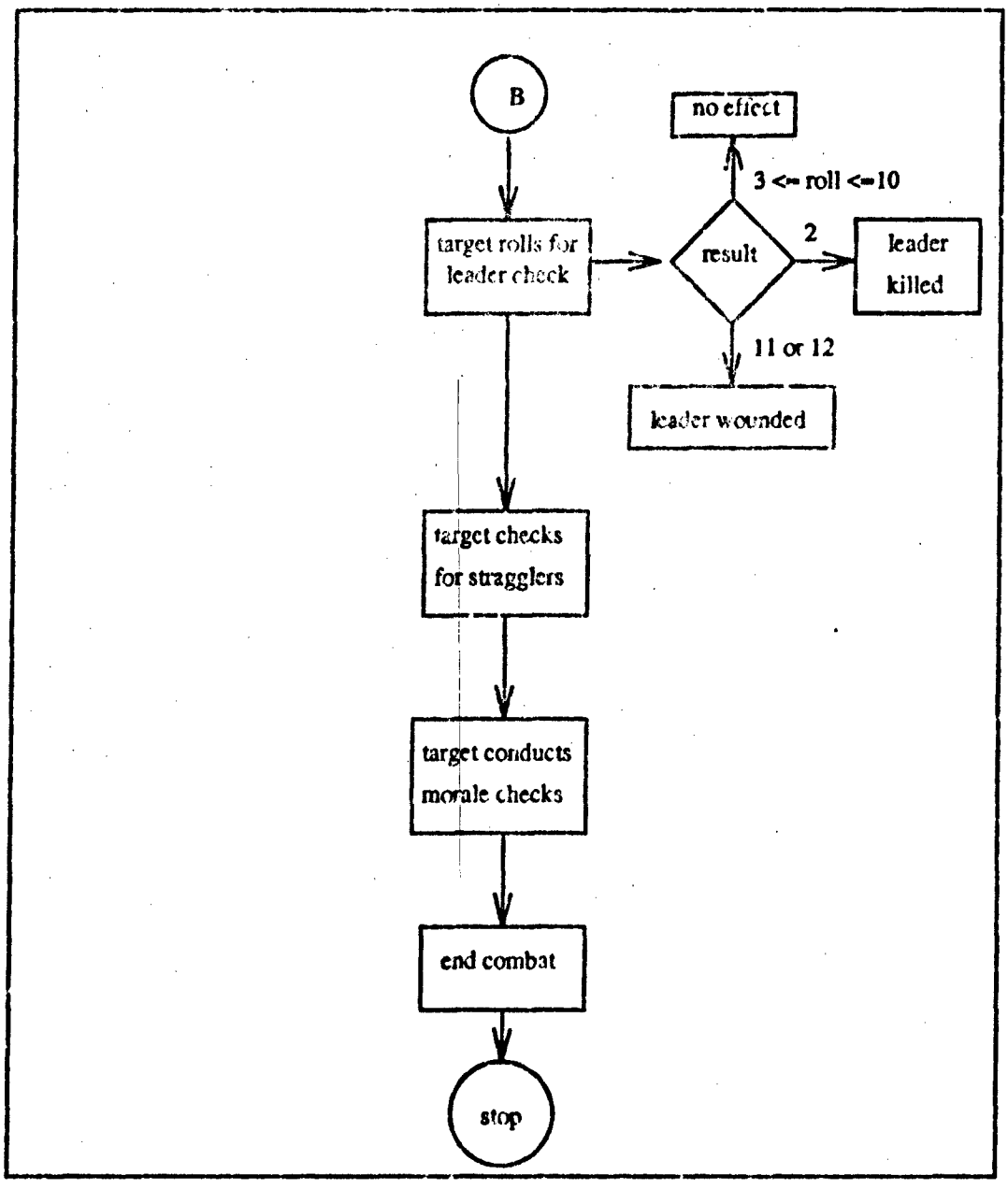


Figure 5.7. Flowchart for Fire Combat (cont)

army and corps commanders were responsible to move and position supply wagons to maintain an unrestricted path between the supply points and the forward units. As long as the path was free of enemy units, a continuous flow of supplies could move forward. For example, if an infantry unit became low on ammunition, supply wagons moved to within two hexes of the unit to simulate resupply. If a player neglected to resupply infantry or cavalry units that were low on ammunition, the units would enter each subsequent engagement at a reduced fire level. Army level supply wagons moved to resupply corps supply wagons in the same manner.

The game modeled artillery resupply differently than small arms resupply. Each engagement of five artillery gun points cost one artillery ammunition point. The reduction of ammunition points degraded the artillery unit's subsequent fire mission. Unlike small arms resupply, the supply wagons did not move forward. For artillery resupply, the players had to maintain a clear path to the supply wagons. If an enemy unit blocked the supply route, the artillery unit's fire power reduced by 50 %.

The loss charts described in Section 5.3.5 indicated losses due to combat and stragglers. Losses affected the combat power and status of a unit. Units could recover stragglers during the rally phase. A brigade could regain combat strength by recovering stragglers. Players could attach recovered stragglers to a brigade not in contact if the brigade was within 800 yards (4 hexes) of where the straggler loss occurred.

The process of accounting for ammunition and personnel losses provided a method of replicating an important element of command and imparted a higher degree of realism to the game's play.

5.7 *Model Characteristics*

This section discusses the five model characteristics of resolution level, documentation, learning time, playing time, and flexibility and how each applies to *Thunder at the Crossroads.*

5.7.1 Resolution Level. Although the line of distinction between high resolution and aggregated games is sometimes nebulous, I would consider the game to be aggregated based on the method of fire levels and attrition.

5.7.2 Documentation. The documentation was complete, easy to understand, and had numerous examples. The only shortcoming to the documentation is that it had numerous mistakes that required several calls to the designer for clarification. The designer corrected the mistakes in subsequent versions of the game.

5.7.3 Learning Time. The learning time for the model will be different from person to person based on each individual's experience with board games. I played the game for about 16 hours before I felt comfortable with the game system well enough to begin playing the research scenarios.

5.7.4 Playing Time. The playing time is nearly a 1 to 1 correspondence with real time. Each game turn (30 minutes of historical time) took about 30 minutes of real time.

5.7.5 Flexibility. The model's flexibility is its strongest characteristic. The design of the game made it easy to start play when I wanted and move units to specific points. The ability of a unit to extend its line made multiple fighting elements possible. Table 5.6 summarizes the model characteristics.

Table 5.6. Model Characteristics

Characteristic	Evaluation
Resolution Level	Combat and maneuver conducted at the brigade level
Documentation	Well written with designer hints and explanations of critical areas, however some flaws
Learning Time	A reading of the rules and an ability to conduct model play required 16 hours
Playing Time	Depended on scenario and experience, 45 minutes per game turn
Flexibility	Very good, readily adaptable to "what if" scenarios

5.8 Results of the Research Objectives

5.8.1 Introduction. This section describes the results of the research objectives:

- To compare the combat outcomes of the battle of Little Round Top with the results obtained from a commercial model
- To determine what changes are required in the model to make it more representative of the historical combat
- To determine the sensitivity of the combat outcomes by exploring other "what if" scenarios, given a good relationship between the model and the historical battle.

The first subsection outlines the assumptions used for the model execution. The next three subsections discuss the research objectives and the final subsection is the summary. The analysis includes a discussion of how each battle unfolded and how the results compare to the measures of effectiveness. The game results provide many insights into the historical battle as well as the combat modeling process.

5.8.2 Assumptions. Prior to the discussion of the research results, it is important to understand how the assumptions affected the game play. I made two assumptions/ adjustments to the wargame, *Thunder at the Crossroads* so that the model could reflect the initial conditions of the battle of Little Round Top. The adjustments to the model were only necessary to play scenario 1: recreating the historical battle. The assumptions/ adjustments were in two areas:

- Extended lines
- Fire levels

The technique *Thunder at the Crossroads* used to represent units in the wargame caused one obstacle to recreating the battle. The wargame modeled units down to brigade level. Players could break a brigade down further into extended lines in one or both directions. However, according to the rules an extended line must never separate from its parent unit. This is inconsistent with what actually occurred on the battlefield. In several cases the regiments of a brigade fought in different locations sometimes separated by 600 – 800 yards or intermixed with other units from a different brigade.

The rule to keep a brigade together did not support the actions of Law's and Robertson's brigades on Little Round Top. Half of Robertson's brigade fought on Little Round Top (4th, 5th Tx) as the other half (1st Tx, 3rd Ark) fought nearly 800 yards away in Rose's Woods to the west of Devil's Den. In Law's case, portions of his brigade fought in three different locations. The 44th Ala fought in the Devil's Den, the 48th Ala fought to the left of Robertson's 4th and 5th Tx on the northern portion of Little Round Top while the 4th, 15th, and 47th Ala fought to the right of Robertson's units on the southern portion of Little Round Top. Therefore, in order to replicate the battle I had to allow units of the same brigade to extend lines further than the rules permit.

The splitting of Law's and Robertson's brigades to recreate the historical attack also affected recording casualties on the Confederate loss chart. The chart lists each unit by brigade. The accumulation of casualties caused the fire level for the brigade to reduce. Due to playing only a portion of each brigade, I needed to develop a method to reduce fire levels while maintaining consistency. If I did not do this, the attacking forces could suffer an unusually large number of casualties without any reduction to their fire level. To simplify the problem of reducing the confederate unit's fire level as it suffered casualties, I crossed off every other O on their respective line on the loss chart. This technique accounted for the other half of Law's and Robertson's brigade (assumed to be fighting elsewhere) and still maintained the reduction of fire levels in a proportionate manner.

Although I changed the rules to allow the units to fight more like the battle, I did not change the "spirit" of the rules for extended line play. According to the rules, an extended line's fire level and strength was divided evenly between the extended line and the parent unit. During the game, I used half of Robertson's brigade to represent the Confederate forces that attacked Vincent's 16th Mich and 44th NY and half of Law's brigade to attack Vincent's 20th Me and 83rd Pa.

Table 5.7 shows the similarity in end strength of the game's aggregated units and the historical units I chose them to represent. The term, xl, next to Vincent's name signifies the extended line and it will be used this way through the remainder of the chapter.

Table 5.8 compares the historical force ratios on Little Round Top versus the wargame force ratios. As the table indicates the method of extending lines and allocating units shifted the historical force ratios more in favor of the Union forces.

Thunder at the Crossroads provides a Little Round Top scenario as part of the game. The scenario gives specific initial locations for all Union and Confederate forces. The initial set up accurately reflects the historical locations of the units. To

Table 5.7. Allocation of Units

Unit in Game	Model Strength (Fire level)	Units Represented	Historical Strength	Difference
Robertson	900	4th Tx	415	
	(A)	5th Tx	409	
		Total	824	model +76
Law	1000	15th Ala	499	
	(A)	47 th Ala	347	
		4th Ala	346	
		Total	1192	model -192
Vincent	700	20 Me	386	
	(A)	83 Pa	295	
		Total	681	model +19
Vincent(xl)	600	16 Mich	263	
(extended line)	(B)	44 NY	391	
		Total	654	model -54

Table 5.8. Historical Versus Wargame Force Ratios

	Confederate	VERSUS	Union
Historical Units	4th, 15th, 47th Ala		20th Me, 83rd Pa
Historical strength(sum)	1192		681
Historical force ratio	1.7:1		
Modeled unit	Law		Vincent
Modeled strength	1000		700
Modeled force ratio	1.4:1		
Historical Units	4th and 5th Tx, 48th Ala		16th Mi, 83rd Pa
Historical strength(sum)	1198		654
Historical force ratio	1.8:1		
Modeled unit	Robertson		Vincent, xl
Modeled strength	900		600
Modeled force ratio	1.5:1		

maintain continuity, I used the same game set up for all three game scenarios. Table 5.9 and Figure 5.8 show the initial locations for the units.

The rules provided center of mass locations for the Union V Corps divisions. To simplify the positioning of brigades, I positioned Vincent's, Weed's and Fisher's brigades on their respective division's center of mass.

Table 5.9. Initial Locations for *Thunder at the Crossroads*

North		South	
Unit	Location	Unit	Location
V Corps Art	B33,33	Artillery battery	B15,29
Ward	B21,28 ex lines: B21,27,B20,28	Artillery battery	B16,25
Vincent	B29,33	Robertson	B16,25 ex lines: B16,24, B15,26
Weed	B33,33	Anderson	B14,26 ex line B14,27
Fisher	B35,34	Law	B16,23 ex line B16,22
		Benning	B15,23

With the game's initial conditions set I began to play the first scenario; recreating the battle of Little Round Top.

5.8.3 Compare the Combat Outcome of the Battle of Little Round Top to the Historical Game Scenario. The comparison of the model to the actual battle is in two parts. The first part is a synopsis of the general flow to the wargame. The second part is the comparison to the measures of effectiveness regarding time lines, force ratios, and casualty data. The events of the model scenario are very similar to the actual historical events. For a comparison of the historical events see Tables 3.1 and 3.2. Figure 5.9 shows initial locations of the units and the Confederate axis of advance.

To clarify the units during the discussion of each scenario, I used two identifiers: (-) and (xl). The (-) symbol represents the parent unit while the (xl) symbol represents the extended line. For example, Vincent(-) is the parent unit and Vincent(xl) is the extended line.

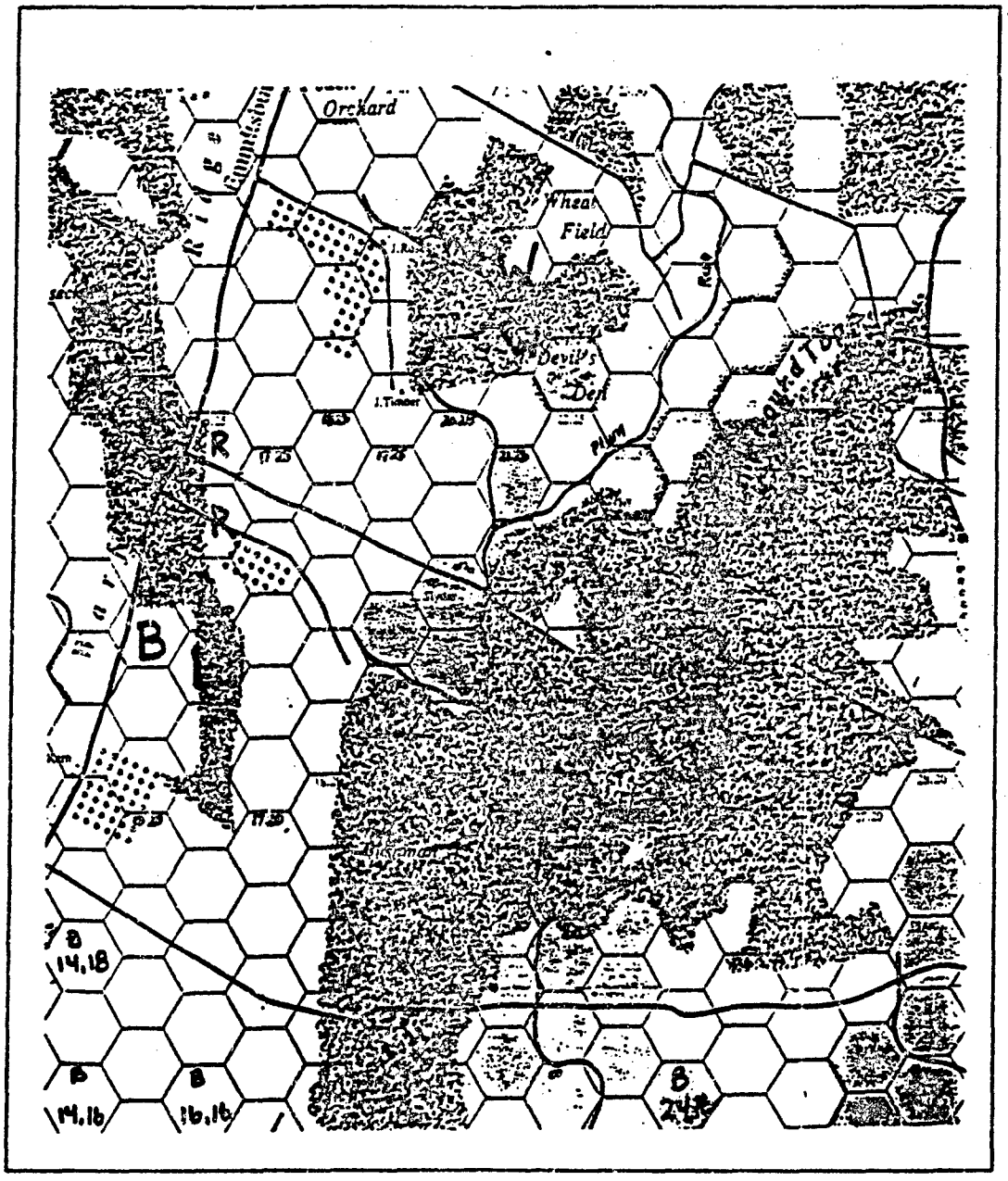


Figure 5.8. Initial Locations

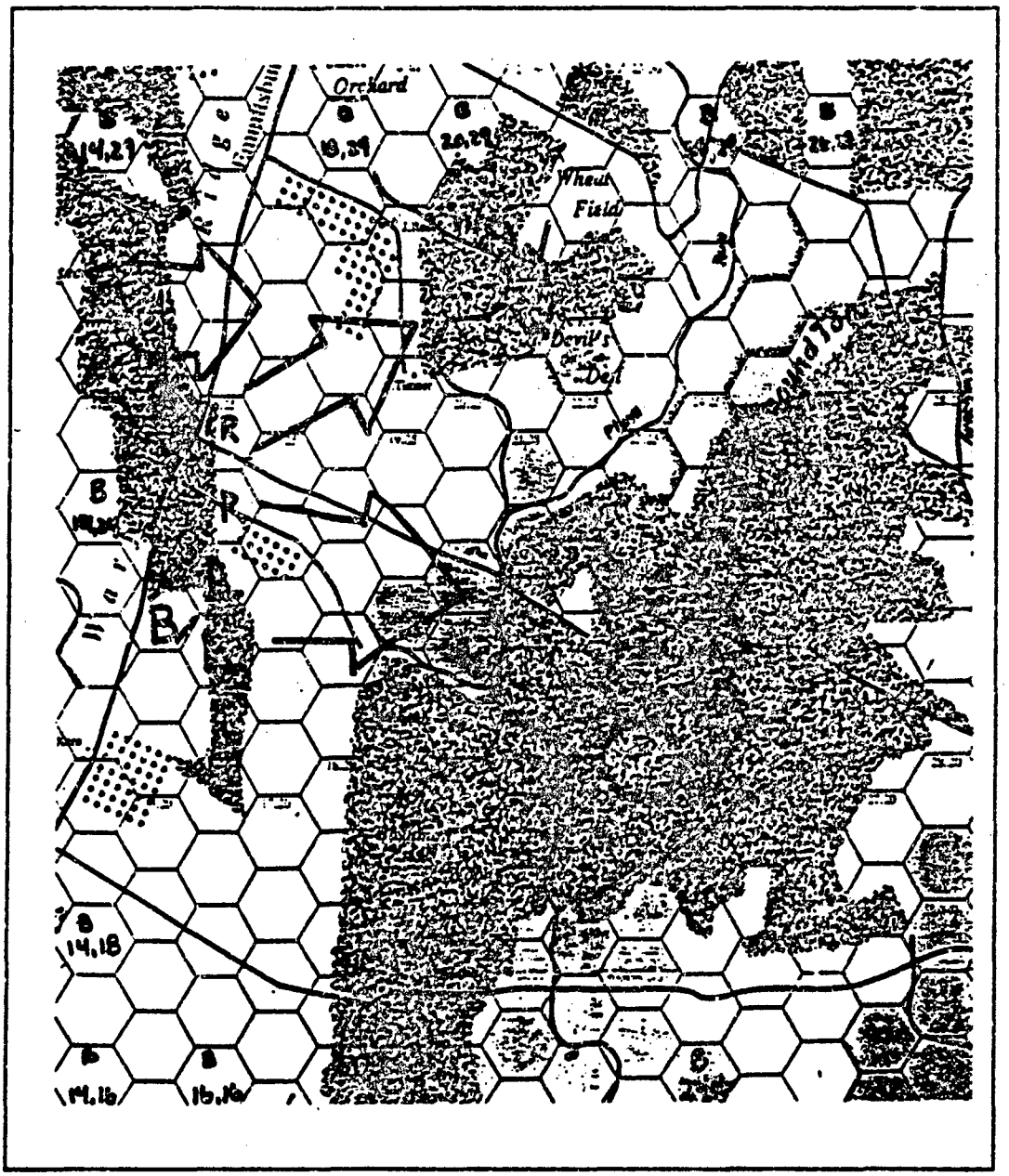


Figure 5.9. Scenario 1: Attack Axis

Hood's division began the attack at 4 pm. Law's brigade and Robertson (-) moved east towards Big Round Top and reached the west bank of Plum Run unopposed. Robertson (xl), Benning's brigade, and Anderson's brigade attacked Ward's brigade in the Devil's Den.

I used two Confederate artillery units in support. The artillery fire into Devil's Den did not produce any casualties.

The Union forces of Ward's brigade began their defense with artillery and small arms fire as the Confederates launched their attack. The opening volleys of the attack produced 300 casualties to Ward's brigade and 200 to Robertson's (xl).

The rules allowed for Union movement to reinforce Little Round Top after the Confederates began their attack. Vincent's and Weed's brigades began their movement south towards Little Round Top from their initial locations in the north.

At 4:30 pm Hood's division moved on line and attacked Ward's brigade in the Devil's Den (minus Law's brigade and Robertson(-)). The Confederate attack began to overwhelm Ward. Although Ward was still inflicting heavy casualties on the Confederate units, his own strength was decreasing rapidly. His fire level dropped to AA. The drop in fire level decreased the strength of his extended lines causing them to be less effective.

Law(-) and Robertson(-) entered the woodline to the west of Big Round Top and began to scale the hill. Law(xl) cut behind Law(-) and Robertson(-) and attacked north towards Smith's battery in the Devil's Den.

Vincent's brigade occupied Little Round Top at the completion of the 5 pm game turn. Vincent(-) represented the 20th Maine and the 83rd Pennsylvania and occupied the southern half. Vincent (xl) represented the 44th New York and 16th Michigan and occupied the northern half.

During the 5pm game turn the cumulative effect of the Confederate fires destroyed Ward's brigade. At this point in the wargame, the Confederates pushed

Ward north and opened the Plum Run Valley. To model the battle of the Wheatfield would expand this study and increase the number of playing units considerably. I felt this was a good place to stop as a reference to how the other scenarios developed the battle for Devil's Den. In the historical battle, the Confederates cleared the way for a two pronged attack when they forced the Union forces out of Devil's Den. I was interested in how the other scenarios, with the changing of force ratios more towards Ward's favor, played out that portion of the battle. If the other scenarios also pushed Ward out of Devil's Den, this could provide some insight into the battle and suggest other questions. I then concentrated on the battle as it developed on Little Round Top.

Law(-) and Robertson(-) continued to attack towards Little Round Top while the rest of Hood's division pushed Ward out of the Devil's Den. Law(-) began to move down the northern slope of Big Round Top towards Vincent. Robertson(-) moved laterally along the ridge of Big Round Top and moved into position to strike Vincent from the west.

The firing on Little Round Top began during the 5:30 pm game turn. When the firing began the units had the fire levels of: Law(-) A, Robertson(-) A, Vincent(-) A, and Vincent(xl) B.

The attack on Little Round Top was a good example of the advantage the game gave to the defender. If the same units fought in an open field on level terrain the A fire level units would use the same fire point column to determine results from the Combat Results Table. However, in this situation the Confederates attacked up the slope of the hill. To model the advantage of a defender on the high ground, the rules directed the Confederate units to conduct one column shift to the left whenever they fired. The rule automatically reduced their fire point level from a 4 to a 2 rating.

The effect of the Confederate column shift reduced the probability of a successful attack. The Union forces had a higher probability of inflicting casualties (.75) than the Confederates (.50) when both sides volleyed during each combat phase.

Additionally, Vincent's brigade had a more stable fire level. Vincent was able to withstand a greater number of casualties compared to the Confederates before becoming wrecked. Although I modeled one battle, in the long run I would expect the Union forces to retain Little Round Top.

During the 5:30 game turn, Robertson(-) obtained initial success by inflicting 100 casualties and 50 stragglers on Vincent(xl). While Robertson hit Vincent from the west, Law attacked Vincent(-) from the south.

The Confederates continued their attack during the 6 pm game turn. Vincent's brigade suffered casualties from both sides. Vincent(-) lost 200 while Vincent(xl) lost 100. The initial Confederate attack weakened Vincent's brigade. Vincent's fire level dropped from AE to A. Due to the extended line rule, both of Vincent's units now had a B fire level (1 A = 2 B's). Vincent's units now determined their combat results from the 2 fire point column of the Combat Results Table.

By then however, Weed(-), representing O'Rorke's 140th New York, made their way to Little Round Top. This was similar to the historical battle when the northern portion of Vincent's line was under severe pressure from the Confederates and O'Rorke's timely counterattack secured the northern flank.

The increase in fire points in the northern portion of Little Round Top gave the Union forces a considerable advantage over Robertson(-). Robertson suffered 200 casualties and 50 stragglers during O'Rorke's counterattack. The loss of men reduced Robertson's fire point level to B. Robertson's decrease in fire level had a compounded effect on his fire points. Robertson now had 1 fire point according to the Combat Results Table. The B gave him 2 fire points and the column modifier moved him one column to the left. On the southern portion of the hilltop, Law(-) suffered 100 casualties to Vincent's 200.

During the 6:30 pm game turn the Confederates continued their attack up Little Round Top. However, Law(-) suffered 200 casualties which reduced his fire

level to B. Law was in the same predicament as Robertson. Both units now attacked with a fire point value of 1. Each had little chance for success.

The game ended during the 7 pm game turn. The combined effects of Weed(-) and Vincent(xl) broke Robertson. Robertson suffered 200 casualties and his brigade became combat ineffective. Law suffered the same fate from Vincent(-).

A comparison of the time lines to the wargame and the historical battle provide two insights. The first is in the modeling process. As discussed earlier, the initial movement of Law's and Robertson's units to Little Round Top took twice as long as in the historical battle. The wargame needs to adjust the movement points for an infantry unit in an assault mode.

The second insight derived from comparing the time lines of the battle versus the model was the importance of the timely counterattack by LTC O'Rorke. In the model Robertson was having some initial success against Vincent(xl). However, the addition of O'Rorke into the battle gave enough Union fire points fired at Roberston to reduce his strength to where he was no longer a threat. O'Rorke's counterattack during the actual battle achieved the same result.

The second quantitative method used in the examination of the wargame was the comparison of force ratios. As discussed in the previous section, the force ratios favored the Union on Little Round Top. Therefore, when combined with the terrain advantages, one would expect the results to occur as they did. Law(-) versus Vincent(-) was 1.7:1 for the historical battle compared to 1.4 :1 for the model. Robertson(-) versus Vincent(xl) was 1.8:1 for the historical battle compared to 1.5:1 for the model (Table 5.8). The game clearly gave Vincent an advantage on the defense. The other two scenarios changed several of the force ratios at the point of attack and would provide further insight into the battle.

The final quantitative measure used in the examination of the battle was the number of casualties. I was not as concerned for a comparison of the exact numbers as

I was for the trends and percentage change when comparing the model to the battle. The rule for the Confederate column shift during combat decreased the probability of the Confederates to inflict casualties (.50 for the Confederates compared to .75 for the Union). The column shift also affected the amount of casualties the Confederates could inflict. The Confederates had a .49 chance of inflicting 100 casualties and a .01 chance of inflicting 200 casualties. However, the Union had a .67 chance of inflicting 100 casualties and a .08 chance of inflicting 200 casualties.

Table 5.10 shows how the strengths of Robertson(-) and Vincent(xl) changed during the game compared to the historical battle. During the historical battle Robertson's forces suffered casualties at a rate of about 1.9 to Vincent's 1. However during the game Robertson suffered casualties at a rate of 2.2 to every 1 of Vincent's. These numbers ended up to be close.

Table 5.10. Casualty Results of Robertson(-) Versus Vincent(xl)

Unit	Start Strength	Game Losses	Game % Change	Historical Losses	Historical % Change
Robertson(-)	900	550	61	323	39.2
Vincent(xl)	600	250	42	171	26.1

Figure 5.10 shows how the strengths of the combating units decreased over time. You can see the effect of Weed(-) (O'Rorke) entering the battle at 6 pm. Vincent's strength stabilized primarily because Weed(-) picked up the fight.

Table 5.11 shows how the strengths of Law(-) and Vincent(-) changed during the game compared to the historical battle. During the historical battle Law's(-) forces suffered casualties at a rate of about 1.2 to Vincent's 1. However during the game, Law suffered casualties at a rate of about 1.8 to every 1 of Vincent's.

Figure 5.11 shows how the strengths of Law(-) and Vincent(-) decreased over time. Vincent's terrain advantage was a major factor in their engagement. Both units started the battle at A fire levels. Law's column shift on the Combat Results

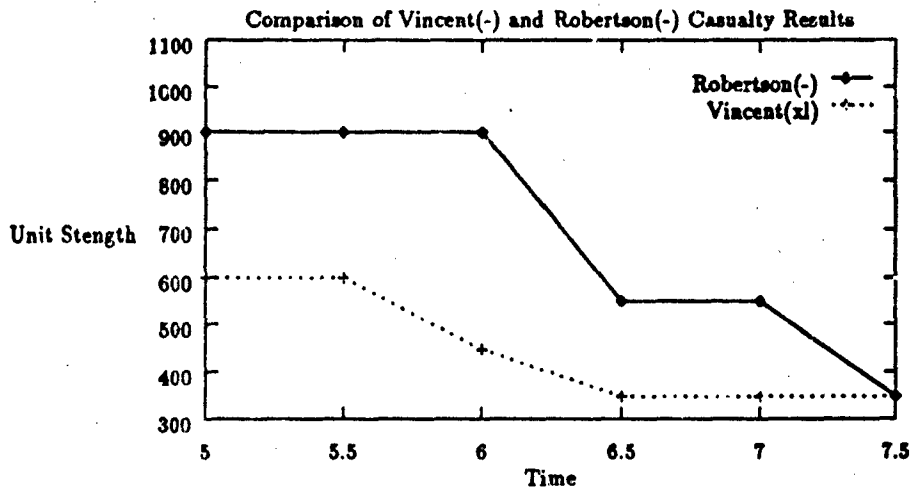


Figure 5.10. Casualty Results of Robertson(-) Versus Vincent(xl)

Table 5.11. Casualty Results of Law(-) Versus Vincent(-)

Unit	Start Strength	Game Losses	Game % Change	Historical Losses	Historical % Change
Law(-)	1000	550	55	215	25.4
Vincent(-)	700	300	43	180	26.4

Table reduced his ability to inflict casualties compared to Vincent. By the 6:30 pm game turn the cumulative loss of casualties reduced Law's strength to a B level which further increased the odds against him. Law now conducted combat with 1 column shift because of the reduction to B fire level and 1 column shift because he was attacking uphill.

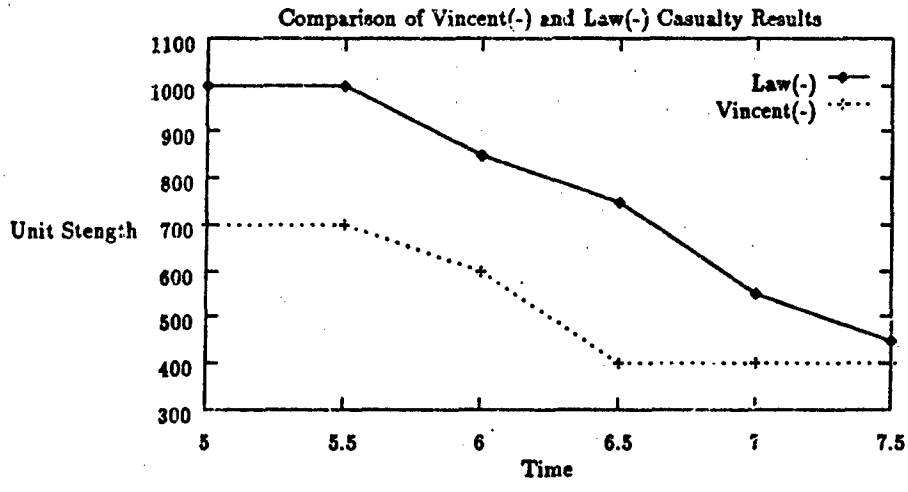


Figure 5.11. Casualty Results of Law(-) Versus Vincent(-)

The results of the first research objective showed the wargame modeled the actual battle fairly close. The breakdown of the Combat Results Table and the dice rolls provide variability in the game where the precise results of any two games is highly unlikely. However, the column shifts for the defender shift the probability of a successful defense clearly in the Union's favor.

5.8.4 Determine What Changes are Required in the Model to Make it More Representative of Historical Combat. One must be careful drawing any conclusions between one historical outcome versus one model game play. The temptation is to define both outcomes as the way the events will always occur. This would then make for easy comparisons. However, the battle was fought once and the result

could have easily been different. At the same time, the dice rolls could result in a highly improbable outcome. Therefore, the issue becomes does the game allow the players the same options available to the historical commanders.

Thunder at the Crossroads requires very few changes to make it more representative of historical combat. I will only present a list of the changes I have already discussed in the previous subsections. The changes addressed so far are:

- Movement rates during assaults
- Ability to fight at regimental level

Another change to the model is an adjustment to the close combat rules. The close combat between the 20th Maine and the 15th Alabama is well documented. However, the game rules prevented this type of combat. Law(-) did not have enough movement points to execute close combat. Law(-) had 6 movement points per game turn. In order to conduct close combat with Vincent's(-) position he needed 7 (4 to move up an extreme slope, 2 to enter a woods hex, and 1 to conduct close combat). As a result, the game was unable to replicate some of the most stirring events of the battle.

The problem with adding enhancements to any game is that they tend to slow the game down. The dilemma facing a game designer becomes how to balance the level of detail of the game with its play-ability and player enjoyment of the game. The balancing point for commercial wargames is determined by the marketplace.

5.8.5 Determine the Sensitivity of the Battle Outcome to Different Battle Alternatives. This section will analyze the results of the game play for the last two scenarios:

- Scenario 2: Law' brigade attacks Chamberlain from the flank
- Scenario 3: Benning's brigade follows Law during the attack

The scenarios had five similarities. First, both scenarios started with the same initial conditions as scenario 1. Second, both attacks started at 4 pm. Third, they had the remaining units of Hood's division attack Ward's brigade in the Devil's Den. Fourth, both used the same attack axis for Law, the lead unit. Fifth, both scenarios had the initial point of contact the southeast corner of Vincent's brigade, representing the rear of the 20th Maine.

The following paragraphs will outline the event sequence for each scenario and how each scenario compared to the historical situation in respect to time lines, force ratios, and casualty rates. The first scenario discussed is scenario two.

5.8.6 Scenario 2: Law's Brigade Attacks Chamberlain from the Flank. In this scenario Law's brigade attack axis curved south of Big Round Top and hooked around to hit Vincent (20th Me and 83rd Pa) from the rear. The remainder of Hood's division attacked Ward's brigade and Smith's battery in the Devil's Den (Figure 5.12).

Hood's division began the attack at 4 pm. Robertson's, Benning's, and Anderson's brigades attacked towards Devil's Den. Law's brigade moved southeast to get on the road south of Big Round Top that connected the Emmitsburg road with the Tanneytown road. Confederate artillery prepped Ward's position in Devil's Den.

The Union forces of Ward's brigade began their defense with artillery and small arms fire as the Confederates launched their attack.

During the 4 pm game turn Vincent and Weed began movement to Little Round Top from their initial positions in the north. I used the initial orders given to V corps units written in the rule-book. The Union V Corps had orders to defend Little Round Top and support III Corps if it was attacked (15:4). The V Corps orders went into effect during the turn after any III Corps unit was fired on by rifle fire.

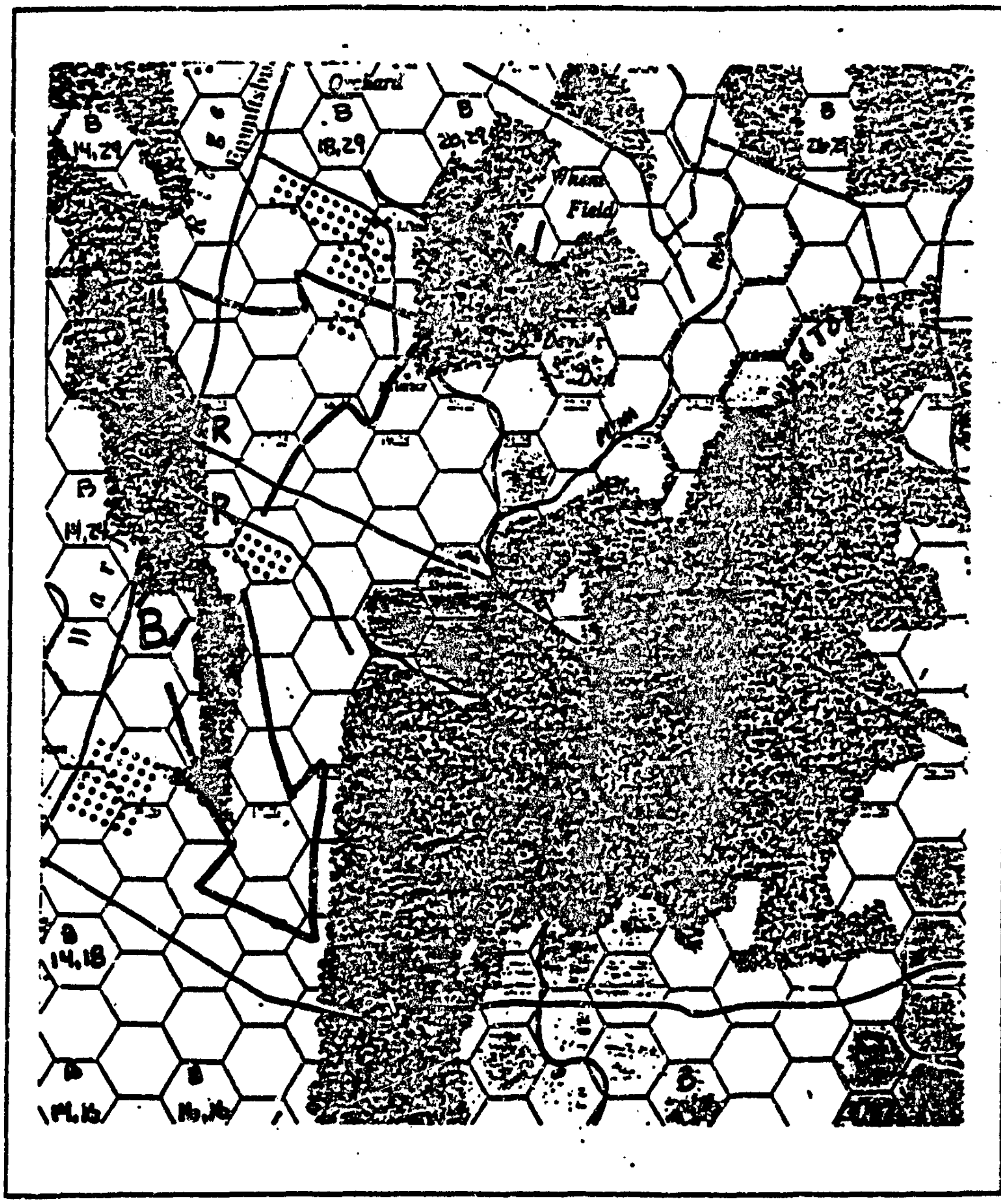


Figure 5.12. Scenario 2: Attack Axis

By 4:30 pm Robertson's and Benning's brigades reached Devil's Den. Ward massed fires on Robertson and inflicted 400 casualties and 50 stragglers. The Confederates countered and inflicted 200 casualties on Ward.

The Confederate assault in the Devil's Den continued during the 5 pm game turn. By this time Anderson also moved into position to attack Ward. Ward continued to take severe casualties. Ward continued to mass his fires on Robertson and inflicted another 400 casualties.

Benning's brigade moved to the east side of Devil s Den to flank Ward and Smith's battery. Smith's battery fired at Benning and inflicted 100 casualties and 50 stragglers.

Law's brigade continued their move around Big Round Top. By the end of the 5 pm game turn, they were on the east side of Big Round Top skirting the woodline north towards Little Round Top.

The Union V Corps forces continued their move to support III Corps. Vincent's brigade was at the northern slope of Little Round Top. Weed's brigade and Hazlett's battery were about 1000 yards to the north of Vincent.

By 5:30 pm the attack in the Devil's Den was over. The Confederates overwhelmed Ward and destroyed his brigade. The Confederates lost Robertson's brigade, Benning's brigade fire level reduced from AB to A, but Anderson's brigade was still intact.

Law's brigade moved into the woods to the southeast of Little Round Top. The lead unit of Law's brigade initially engaged the southern half of Vincent's brigade. Law's trail unit was not in a position to fire yet.

Vincent's brigade was in an extended line formation as in the first scenario. Vincent(-) representing the 20th Maine and the 83rd Pennsylvania defended the southern portion while the extended line representing the 44th New York and the 16th Michigan occupied the northern portion.

Law(-) exchanged volleys with Vincent(-). Both units had a fire level of 4. However, Law(-) attacked uphill therefore, the column shift modifier was in effect. The effects of Law's(-) fires came from the 2 fire point column. Although I rolled a 7 for both sides during their respective combat, Vincent came out of the engagement in better shape. Law suffered 100 casualties while Vincent did not suffer any.

During the Union's movement phase of the 5:30 pm game turn, Vincent's extended line moved to the east side of Little Round Top to support Vincent(-). Vincent's brigade now occupied hexes B25,25 and B26,25. Both fired at Law(-) and inflicted another 100 casualties.

During the 6 pm game turn Law's extended line moved into position (B25,24) to fire at Vincent(-) who still occupied Little Round Top. Vincent's and Law's brigades continued to exchange fire. One important point during the combat was that neither side was able to mass its fire. The stacking rule that limited the fire level of a stack to 4 points forced Vincent's northern unit off of Little Round Top and move into a position to fire on Law's brigade. The result was two individual engagements. Law(xl) attacked up Little Round Top against Vincent(-) from the south. Meanwhile, Law's(-) fought Vincent's extended line in the woods along the eastern slope of Little Round Top. As long as the Confederates continued to attack from the south and southeast, the Union forces could not all stay on Little Round Top and fire at the Confederates because of the stacking rule. The Confederate forces reduced the advantage given to the defender on the high ground.

The volley fire between Vincent and Law resulted in 200 casualties for both sides. Law also incurred a loss of 50 stragglers. Due to the casualties, Vincent's fire level dropped from AB to A. Vincent's brigade reconsolidated on the top of Little Round Top. Vincent's reconsolidation maintained one brigade unit at an A fire level rather than have two B units.

During the Union's movement phase of the 6 pm game turn, Weed's brigade occupied the position vacated by Vincent's extended line. The Confederates opened

fire on Weed and inflicted 200 casualties. Vincent's brigade then fired on Law's extended line directly south of Little Round Top. Law's extended line suffered 200 casualties.

The 6:30 pm game turn began with Vincent's brigade occupying Little Round Top (B25,25) with an A fire level. Weed's brigade occupied the woods to the east of Little Round Top (B26,25) with a fire level of AB. Law's(-) (B26,24) opposed Weed's brigade and had a fire level of B. Law's extended line occupied the woods south of Little Round Top (B25,24) with an A fire level.

The Union forces initiated firing at 6:30 pm. During the half hour's worth of combat, Law's brigade suffered 500 casualties. The cumulative effects of the losses reduced his fire level past the wrecked marker on the casualty line. Without reinforcements, his brigade was no longer combat effective. The Union forces retained control of Little Round Top.

It is difficult to compare the time lines of the second scenario to the first scenario because some of the units were doing different things. However, there are two events of commonality. The first is that the massing of Confederate fires on Ward's brigade in Devil's Den pushed him out sooner than in the first scenario.

The second event to compare was the time it took the first Confederate unit (in this case Law's brigade) to come in contact with a Vincent's brigade on Little Round Top. Law's brigade took 1 1/2 hours to reach Vincent's brigade. Law took the same amount of time moving all the way around Little Round Top as it took scaling Big Round Top during the first scenario. In both cases, the time was 45 minutes longer than it took the actual forces to converge on Little Round Top.

The second quantitative method used to analyze the wargame was the examination of force ratios. When Law's brigade initially engaged Vincent the force ratio at the point of attack was 1.4:1 in favor of the Confederates (Law(-) of 1000 to Vincent(-) of 700). However, Vincent quickly reinforced his southern unit the next

game turn. This changed the force ratio to 1.3:1 in favor of the Union forces (Vincent 1300 to Law(-) 900). Law's extended line moved into position to attack Vincent from the south and the battle turned into two separate engagements. When Weed's brigade arrived the force ratio changed dramatically in the union's favor (Vincent's 1100 and Weed's 1500 versus Law's 1450). Figure 5.13 shows the engaging force strength for both sides over time. Figure 5.14 shows the Union's increasing force ratio over time.

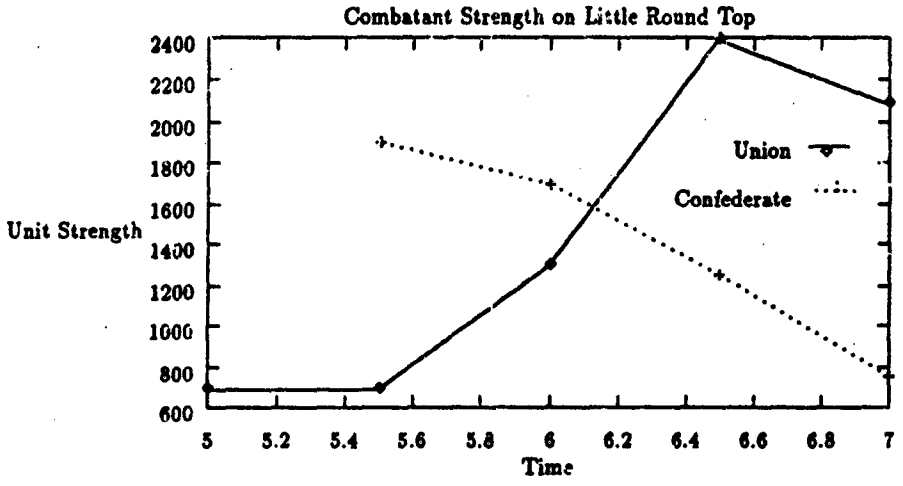


Figure 5.13. Unit Strengths on Little Round Top

The results of the second scenario emphasized three points. First, the positive effect of concentration of firepower on Ward's brigade at the Devil's Den. Second, was the importance of the Confederate forces maneuvering to draw forces off of Little Round Top. Had Vincent not moved off Little Round Top to flank Law, Law's brigade could have concentrated the entire brigade on Vincent's flank. Law would have attacked Vincent's flank with more fire points even with the disadvantage of attacking up hill. The third insight was the Union's ability to reinforce with Weed's brigade. With the addition of Weed's brigade into the battle, Law could not hold on. Law needed reinforcements to continue the attack.

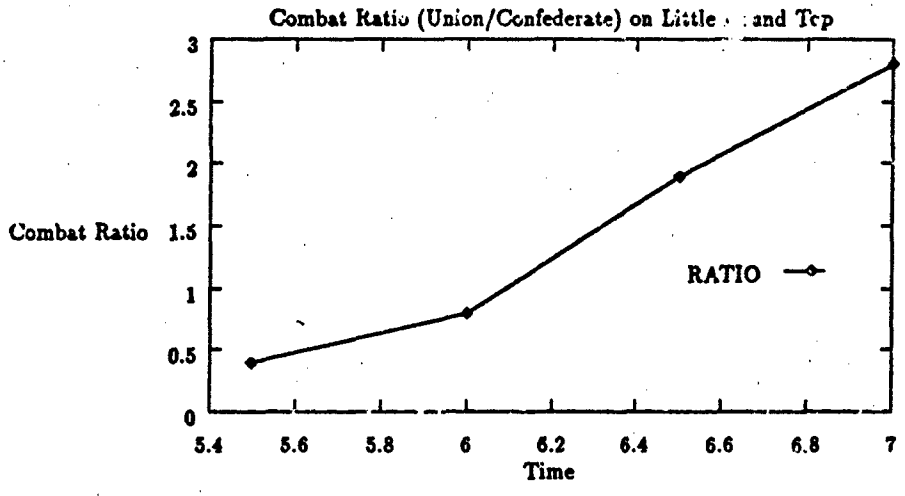


Figure 5.14. Combat Ratio (Union/Confederate) on Little Round Top

5.8.7 Scenario 3: Benning's Brigade follows Law's Brigade and Attacks Chamberlain from the Flank. In this scenario Law's and Benning's attack axis curved south of Big Round Top and hooked around tc Hit Vincent (20th Me and 83rd Pa) from the rear. The remainder of Hood's division attacked Ward's brigade and Smith's battery in the Devil's Den (Figure 5.15).

Hood's division began the attack at 4 pm. Robertson's and Anderson's brigades attacked towards Devil's Den. Law's and Benning's brigades moved southeast and followed the same attack axis as in scenario 2. The Confederate artillery prepped Ward's position in the Devil's Den.

The Union forces of Ward's brigade began their defense with artillery and small arms fire as the Confederate launched their attack. The Union could not engage either Law's or Benning's brigade because they were out of range.

During the 4 pm game turn the only units to conduct combat were Ward and Robertson. Both units lost 200 casualties and 50 stragglers.

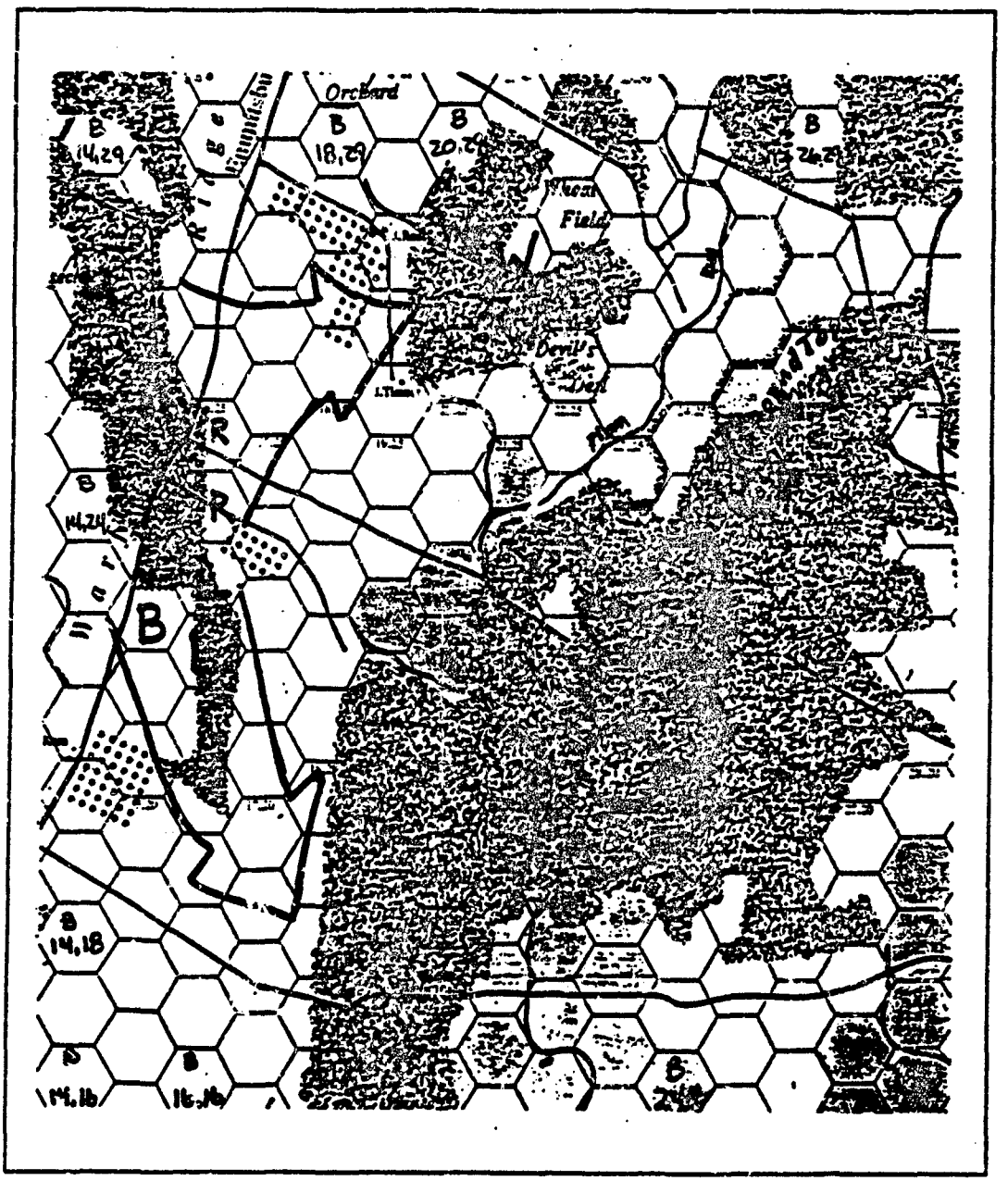


Figure 5.15. Scenario 3: Attack Axis

The Union V Corps units of Vincent and Weed began to move towards Little Round Top once the fighting began in Devil's Den.

By 4:30 Anderson moved to support Robertson. Their combined effect caused Ward to lose another 600 soldiers. Ward's fire level dropped to AB. Ward then reconsolidated his forces into the base unit and one extended line.

Law and Benning continued their flank move around Big Round Top. By the end of the 4:30 game turn they reached the southeast corner of Big Round Top (B28,18).

The V Corps forces continued their move towards Little Round Top from the north. By the end of the game turn Vincent reached the northern slope of Little Round Top. Weed with Hazlett's battery was about 800 yards to the north.

During the 5 pm game turn the Confederate units of Robertson and Anderson enveloped Ward. The ensuing fire devastated the Union brigade. Ward's brigade was eventually destroyed by the end of the game turn.

Law's and Benning's brigades moved north along the woodline east of Big Round Top towards Little Round Top.

At 5:30 the attack on Little Round Top began. Law(-) moved into position on the southeast side of Little Round Top. Law(xl) and Benning's brigade moved into position to the left of Law(-), south of Little Round Top.

Vincent(-) initiated fire at Law(-). The engagement inflicted 100 casualties and 50 stragglers on the Confederates. The Confederates countered by massing the fires of Law(-) and the stack of Benning with Law's (xl). The confederates had 8 fire points but the column shift reduced their level to the 5 – 6 column. Vincent suffered 100 casualties.

During the Union players turn Vincent consolidated his brigade on Little Round Top. His entire brigade occupied the southern portion of the hill. Weed, who had occupied the northern portion of Little Round Top, moved down the south-

east slope to engage Law(-). The maneuver increased the Union forces fire level versus the Confederates.

The final combat phase of the 5:30 game turn ended with Vincent's brigade suffering 100 casualties and 50 stragglers. Vincent's brigade now fought at an A fire level. No other units suffered any casualties.

Benning's brigade moved to the southwest side of Little Round Top during the 6 pm movement phase. The move allowed the Confederates to fire at Vincent's brigade from three sides. Law's brigade was to Vincent's southeast and south. Benning was to Vincent's southwest. During the resulting combat between Vincent and the Confederates both sides took 100 casualties.

Weed extended lines during the Union's 6 pm movement phase to increase the fire level on Law's brigade. During the following combat phase Vincent lost another 100 casualties while Law lost 200 casualties and 50 stragglers.

During the 6:30 pm game phase, Benning extended lines to increase the fire level versus Vincent. Vincent now had Confederates on four sides. Vincent's brigade lost its combat power and was rendered ineffective. However, just as in other crucial times of the battle, the Union forces had reinforcements. Fisher's brigade of the Pennsylvania Reserves moved into position to take Vincent's place. This was the first of the three scenarios where Fisher's unit came into the battle.

At 7 pm the Confederates continued their attack against Weed and Fisher. The effects of battling Vincent's brigade had taken its toll on the Confederates. Both units attacked at reduced fire levels. The fresh troops of Fisher's brigade combined with the high fire strength of Weed's brigade overpowered the Confederates. Benning's brigade lost 400 casualties during the combat phase and Law's brigade suffered 200. The Confederate brigades were combat ineffective. Once again, the union retained control of Little Round Top.

The most significant change to the time lines of the third scenario compared to the second was that the attack lasted one half hour longer. Had it not been for the timely appearance of Fisher's brigade, the attack would have lasted longer. In fact, the third scenario offered the best opportunity for a Confederate success. The Union's ability to reinforce Little Round Top after Vincent's destruction stopped the attack.

The second quantitative method used to analyze the wargame was the examination of force ratios. When Law's brigade initially engaged Vincent the force ratio at the point of attack was tremendously in favor of the Confederates. However, several factors helped the Union forces. First, Vincent's ability to reinforce during the next game turn followed by Weed's brigade into the battle slowed the attack. Second, although the Confederates massed on Vincent(-), their disadvantage of attacking uphill influenced the combat results. Figure 5.16 illustrates the combatant force strength for both sides over time. Figure 5.17 shows the gradual increase of force ratio favoring the Union.

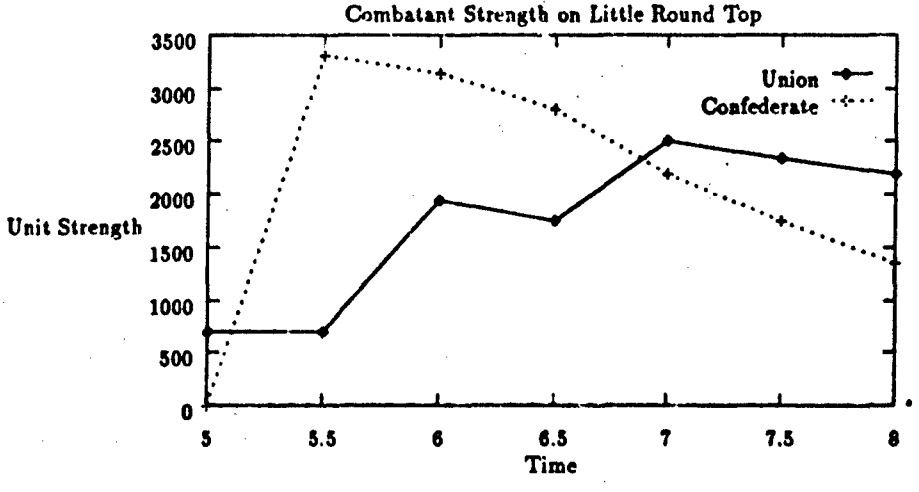


Figure 5.16. Unit Strengths on Little Round Top

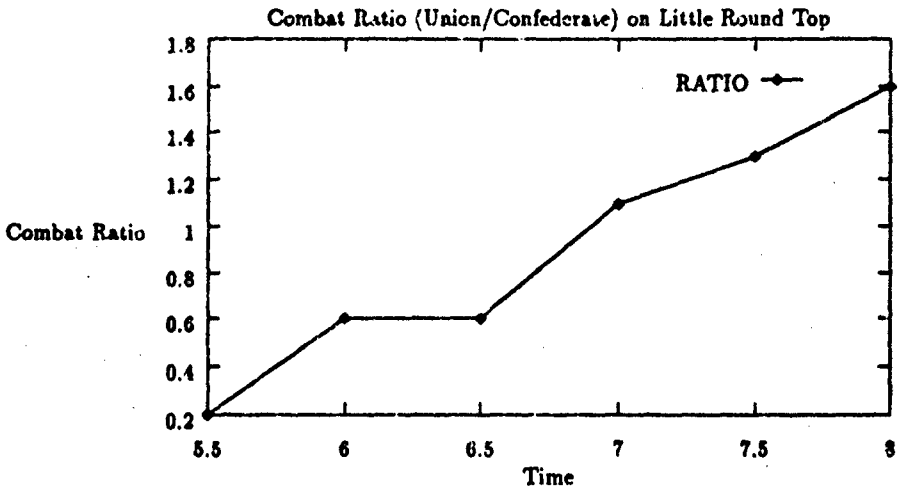


Figure 5.17. Combat Ratio (Union/Confederate) on Little Round Top

5.9 Summary

This chapter provided the model analysis for *Thunder at the Crossroads.* Although some parts of the game are open to debate, such as the game's inability to conduct close combat[3], for the purpose of exploring the historical battle and playing "what if" type scenarios the game served its purpose: to open one's imagination and develop insights. The results of the game must be judged on its insights into the battle not as a precise prediction of what would happen. A model is not a crystal ball but a tool to use to gather insights. If each scenario was played over, the results could be different. Therefore, its not as important to find out what happened as much as it is to find out why it happened.

Thunder at the Crossroads is an excellent model to bring out many of the important drivers of the battle of Little Round Top. The results of the research objectives reinforced the fact that not only is combat a complex process, but any honest attempt to model it is just as complex. The game designer's attempt to

[3]This problem will be fixed in future versions of the game

model command decisions and "fog of war" events brought out many of the uncertainties involved in any mission. The importance of replaying the historical was not to judge the game solely on if the outcomes duplicated the historical battle. The enlightenment begins when the model allows the players to confront the same issues as the historical commanders, make their own decisions and see the results.

VI. Gettysburg: The Turning Point

6.1 Introduction

The purpose of this chapter is to provide the model analysis for *Gettysburg: The Turning Point.* The analysis will include a description of the model and the results of the game play in accordance with the research objectives. The description includes a discussion of the model overview, components, rules, sequence of game turns, combat processes, and characteristics. The results of the research objectives will include how well the model replicated the battle, the results of the different "what if" scenarios and a discussion of the insights and issues raised from the model.

6.2 Model Overview

Strategic Simulations, Inc. produced *Gettysburg: The Turning Point* in 1986. The computer game simulates the battle of Gettysburg. Players take on the roles of the Army commanders, Generals Robert E. Lee and George G. Meade. The wargame is an aggregated, brigade level, two – sided game (Union versus Confederates). Either side may be played by a person or the computer (23:5). The game is compatible with IBM, Apple, Atari, or Commodore 64 machines.

Players have a variety of options available to them during each game's set–up. A screen display provides the players a list of possible game options from which to choose. A player uses the space bar to scroll from options A – O. After scrolling to the option he wants, the player then presses the letter associated with each option to change the condition. Tables 6.1 and 6.2 provide a listing of the options along with a description of possible conditions.

6.3 Components

The components of *Gettysburg: The Turning Point* include:

Table 6.1. Playing Conditions

Option	Description of Conditions
A) NEW GAME SAVED GAME	Choice between a new or a saved game in progress
B) UNION HUMAN COMPUTER	Union player controlled by the player or the computer
C) CONFEDERATE HUMAN COMPUTER	Confederate player controlled by the player or the computer
D) BASIC INTERMEDIATE ADVANCED	Choice of three games with varying complexity
E) HIDDEN UNITS NON-HIDDEN	Only sighted enemy units appear on the map during the combat phase
F) TIME LIMIT NO TIME LIMIT	Sets a time limit on each players operations phase
G) RGB COMPOSITE BLACK AND WHITE	Establishes screen type for graphics
H) ICONS SYMBOLS	How the game displays units, Icons (figure profiles) or symbols (bars)
I) CAV NO CAV	Allows play with additional cavalry reinforcements
J) LEVEL OF PLAY 1 2 3 4 5	Difficulty level. Level 3 is historical with no modifications. Levels 1,2 favor the Confederate (1 more than 2). Levels 4,5 favor the Union (5 more than 4). The levels affect the casualties inflicted in fire and melee combat.
K) UNION ARRIVAL 1 2 3 4 5	Allows for variable arrival times for reinforcements. Level 3 is historical with no changes. Levels 1, 2 allow for earlier and later times respectively by a random time of 0 to 2 turns. Level 4 allows for a random time of 0 to 2 turns earlier to later. Level 5 allows for 0 to 4 turns earlier to later arrival.

Table 6.2. Playing Conditions (cont)

Option	Description of Conditions
L) CONFED ARRIVAL 1 2 3 4 5	Same conditions as option K
M) UNION AMMO 1 2 3 4 5	Allows for variable amounts of ammo in the infantry and artillery pools. Levels 3 is historical with level 1,2 progressively less ammo and 4,5 progressively more.
N) CONFED AMMO 1 2 3 4 5	Same as condition M
O) CAMPAIGN GAME JULY 1–3 FIRST DAY SCENARIO JULY 1 SECOND DAY SCENARIO JULY 2 THIRD DAY SCENARIO JULY 3	Allows choice of the four scenarios

- Rule book
- One 5 1/4in Game disk
- Map card

6.3.1 Rule Book. The rule book provides the basic start up and procedures for game play. The rules outline the initial starting conditions for all units along with their arrival times on the battlefield. The manual includes a series of historical situation maps for each day to assist in replaying the historical battle. The first day's maps show troop dispositions at two – hour intervals. The second day's maps are hourly, beginning with Longstreet's assault at 4 pm. The third day's two maps first show troop dispositions in the morning and then for the afternoon. The rule book has a section introducing the basic game for those who want to start the game quickly and another section for the intermediate and advanced levels that add more intricacy.

6.3.2 Game Disk. The game disk is compatible with IBM, Apple, Atari, and Commodore 64 machines. One also needs an additional disk to save a game. The computer will allow players to save a game in progress at the end of each combat

phase. A game can be restarted where left off, however the initial conditions cannot be changed.

I used a 3 1/2in disk to save a "set up" game. One problem with the game scenarios is that each one starts at 7 am. Unlike *Thunder at the Crossroads* which has a Little Round Top scenario which begins at 4 pm, the day 2 scenario for this game begins at 7 am. The units arrive at their historical times at the entry points on the screen (arrival time 3 option). I then moved the units into position. The process of establishing the historical locations of units takes approximately 6 hours of real time for each game. To avoid duplicating this effort each time, I moved each unit into its historical attack position and then saved the game. For continuity, each scenario started from the same initial locations.

6.3.3 Map Card. The front side of the map card contained the battlefield map for the game. The battlefield is oriented on a 36 X 52 square grid. Each grid square side represents 200 yards across. You can read locations similar to a standard military map, the first number indicates the vertical grid line while the second is the horizontal. For example, the Peach Orchard is in grid square 14,32 (see Figure 6.1). Figure 6.2 shows the symbols that represent various type of terrain, such as roads, woods, and creeks. For example, Rock Creek is the heavy dark line on the right side of the map. The map contains three terrain elevations. Contour lines separate the elevations into 40 – 50 foot intervals.

The reverse side of the map card contains the tables. The purpose of the tables are more for planning purposes than for determination of battle outcomes because the computer does all the number crunching and random number generation. The tables are Operational Cost, Fatigue, Fire and Melee Strength Modifiers, Weapon/Range Casualty, and Melee. Table 6.3 contains a listing and description of each table.

The weapon/range casualty table is an interesting table included in this game but not included in *Thunder at the Crossroads. Gettysburg: The Turning Point* mod-

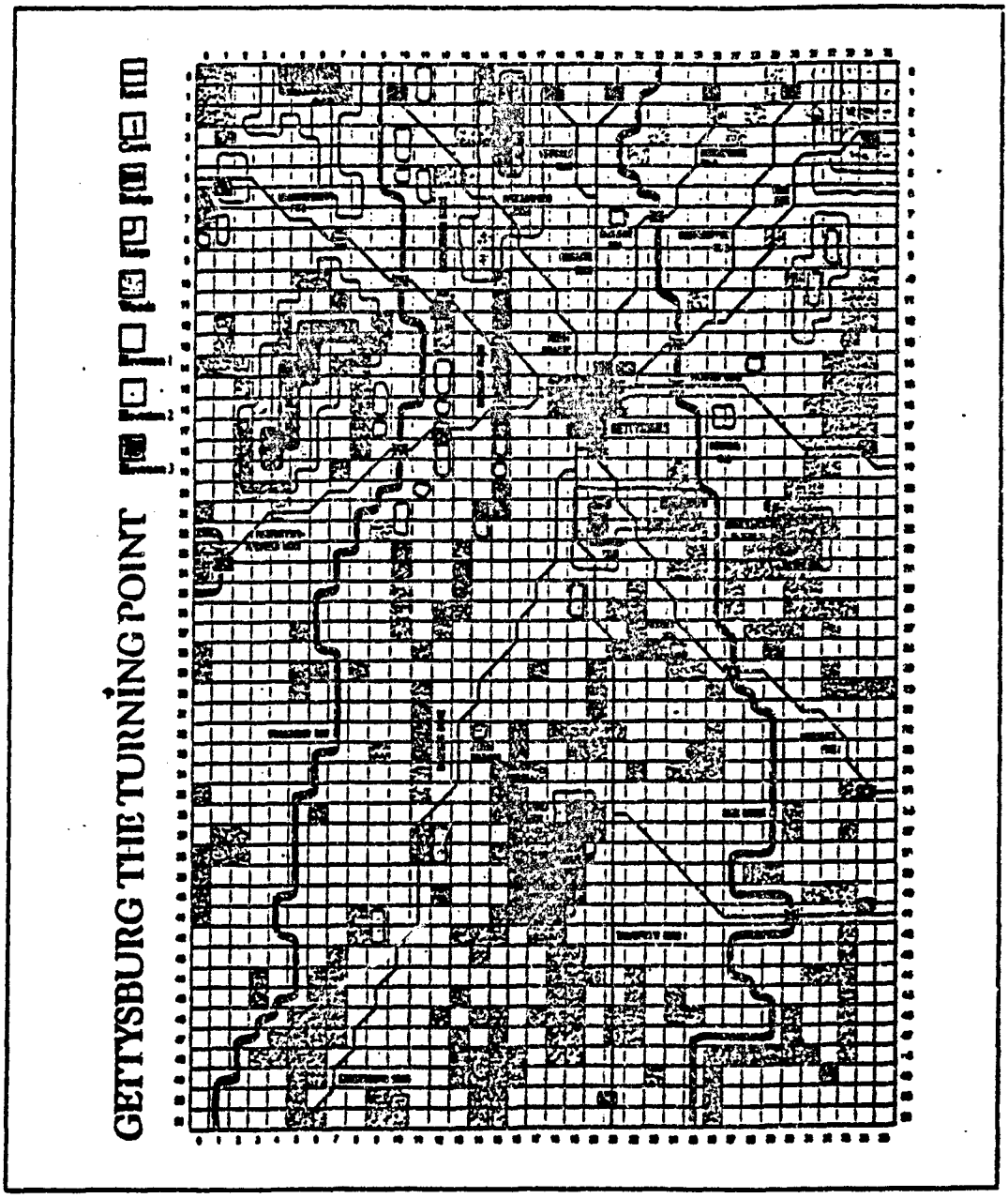


Figure 6.1. Game Map with Terrain Objectives

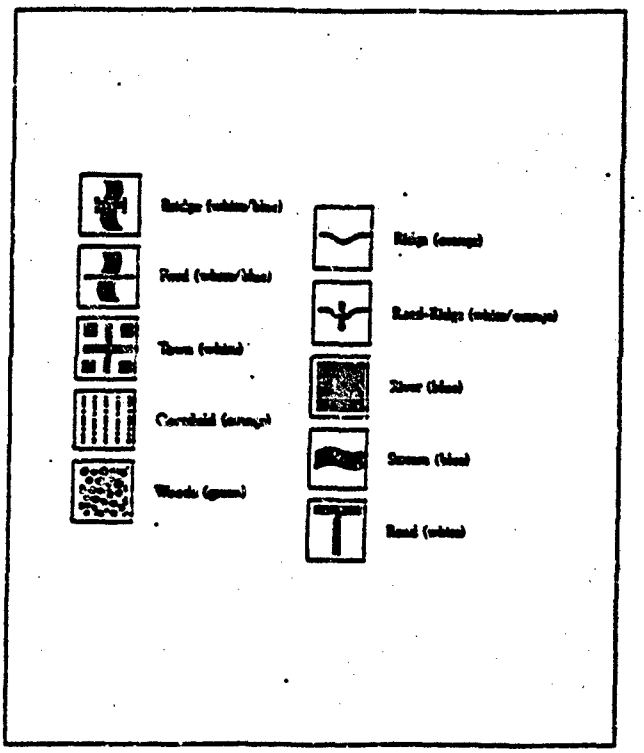


Figure 6.2. Terrain Features

Table 6.3. Tables for *Gettysburg: The Turning Point*

Type	Description
Operation Costs	Provides the cost in operation points to move from one type of grid square to another
Fatigue	Fatigue costs of various combat actions
Fire and Melee Strength modifiers	Modifiers based on target location, firing unit location, special conditions, and unit posture
Melee results	Provides a method to determine the odds which govern losses and retreats during melee (2 to 1 is the break-even point), also provides the odds for the attacker or defender retreating
Weapon/Range casualty	Provides the weapon type with an associated casualty rate at different ranges

els weapons to a higher resolution than *Thunder at the Crossroads*. In *Gettysburg: The Turning Point*, each unit has an attribute that corresponds to the predominate type of weapon used in the unit. For example, Vincent's brigade has rifles and the Union cavalry has carbines. *Thunder at the Crossroads* on the other hand aggregates weapons type with other factors to produce a firepower strength number. In *Gettysburg: The Turning Point*, the types of weapons used for infantry and cavalry units were rifle (smoothbore), musket, rifle/musket, carbine (Spencer), shotgun and pistol. Artillery units had either 12 pound Napoleons, 10 pound Parrots, 3 inch rifled guns, or combinations thereof. Table 6.4 shows the weapons available.

Table 6.4. Weapon/ Range Casualty Table

		Range in squares				
Weapon Type	ABREV	1	2	3	4–6	7–10
Rifle	RFL	6	3	0	0	0
Musket	MSK	4	0	0	0	0
Rifle/Musket	R/M	5	2	0	0	0
Carbine	CRB	12	3	0	0	0
Shotgun	SHG	6	0	0	0	0
Pistol	PST	2	0	0	0	0
12 lb. Napoleon	N12	14	4	2	1	0
3in Rifled Gun	RG3	8	5	4	2	1
3in RG/ 12 lb. Nap.	R/N	11	4	3	1	0
10lb Parrott/ 12lb Nap.	P/N	11	4	3	2	1
10lb Parrott	P10	8	5	5	2	2
3in RG / 10 lb Parrott	R/P	8	5	4	2	1

The number under each range column represents the number of casualties a unit would inflict per 100 firers equipped with small arms or per gun for artillery (23:19). The numbers are then further modified by various combat modifiers to produce the final number of casualties per engagement (each unit has two combat phases per game turn). As a example, a 100 man unit equipped with rifles one square away from the target will inflict 6 casualties (barring any other modifiers). The table clearly rewards the increase of volume of fire the Carbines had over the Rifle. According to the table, at a range of 0 – 200 yards, the Carbine produces

12 casualties while the Rifle 6. However, as the range increases to 200 yards the reduction of the accuracy of the Carbine compared to the rifle makes the weapons equivalent. Unfortunately, the game does not allow players to alter a unit's weapon type.

6.4 Rules

The rules are written in a narrative style and it is usually easy to find what you need. Unlike *Thunder at the Crossroads* the game does not have any combat results tables. Therefore, the rules do not have a lot of verbiage, there are mainly examples on what to do during each sequence of game turn and an index for computer key commands. The rules are much less complex than *Thunder at the Crossroads* while not sacrificing any completeness.

6.5 Description of Game Play

The game is compartmentalized by game turns representing 60 minutes of real time. In the Campaign scenario there are 38 game turns representing time from 8 am on 1 July through 7 pm on 3 July. Each of the day scenarios run from 7 am (8 am for the 1st) to 7 pm Within each game turn, players alternate turns in "Phases". The sequence of play for a game turn is as follows (23:5):

1 Command Control Phase
2 Recovery/Rally Phase
3 Reinforcement Phase
4 Union 1st Operations Phase
5 Union 1st Combat Phase
6 Confederate 1st Operations Phase
7 Confederate 1st Combat Phase
8 Mid- Turn Recovery Phase
9 Union 2nd Operation Phase

10 Union 2nd Combat Phase

11 Confederate 2nd Operations Phase

12 Confederate 2nd Combat Phase

13 End of Day Phase*

14 Victory Determination Phase **

* Only included at the end of the day

** Inprogress reports calculated at the end of each game turn

The sequence of game turns is not as player intensive as it looks. The players have to move their units into position and identify which targets they want to engage (although in some instances the computer will target units for you). Once a player moves his forces into position, he types "C" for combat. The computer asks if the player wants combat, then the player enters "Y". At that point, the computer does most of the work. For example the computer does all the calculations for the command and control, recovery/rally, reinforcement, combat, and victory determination phases. The computer takes the place of the dice rolls and tables that are an integral part of board games. By the computer doing the work, players do not have to think as hard about the battle. Consequently, I did not get the same feeling as "being there" as I did when I played *Thunder at the Crossroads.*

Table 6.5 explains some of the attributes associated with each unit and will help in understanding the explanation of the units and the combat processes.

The game divides each brigade into two separate units, A and B. Players move the units by pressing the numerical computer keys. The keys correspond to directions. The game's design allows for two different keyboard set – ups. At the beginning of the game the players select which style keyboard they will use. Table 6.6 shows the choice of keyboards.

Table 6.5. Attribute Terms

ITEM	DESCRIPTION
Disrupted	Confusion in the unit, disrupted unit loses its priority fire plot, and may only fire in defensive melee (hand –to –hand) combat. Unit has a 40% chance of disruption per 100 casualties (50 for artillery) (23:10)
Ammo points	A measure of the amount of ammunition a unit has. 9 represents full up, 0 represents out of ammo
Melee	Hand – to – hand combat
Morale	Effectiveness minus fatigue. The lower the morale the higher the chance the unit will be routed (retreat).
Mode	Infantry can be in column or normal, Cavalry mounted or dismounted, artillery limbered or unlimbered.
Operation points	The costs for a unit to move from one square to another, change mode, or engage in combat.
Facing	The direction of orientation, the unit can face 8 different directions, facing effects line of sight.
Fortification	A unit can prepare defensive positions ranging in value from 0 – 5 that modify combat results.
Command and Control	A variable that represents the command and control for each unit that modifies the combat results.
Effectiveness	Arbitrary constant assigned to each unit by the game designers, used as direct modifier for combat results (units range from 50 – 90)
Fatigue	Each unit starts the game with 0 fatigue points. Fatigue increase as a unit moves and suffers casualties.

Table 6.6. Keyboard Options

Keyboard Options	
style 1	style 2
8 1 2	7 8 9
7 9 3	4 5 6
6 5 4	1 2 3

I used style 2 (standard IBM compatible keyboard), 8 corresponds to north, 6 east, 2 south etc. Icons (or unit symbols, depending on which game option you choose) perform the same function as the counters did in *Thunder at the Crossroads*. However, the computer provides much more information about the units. A display appears on the lower left hand corner of the screen when a player accesses a unit. For example, the following is an example disposition of Vincent A :

```
UNION VINCENT -- A INF 649 MEN
DS:N AMMO:9 MEL:Y MRL:60 FIRE 18,36
NORMAL OP:7  DIR:4  ADV:Y
CLEAR(3)  X,Y:19,36
```

Typing "P" activates the second page...

```
UNION VINCENT -- A INF  649 MEN
FORT:0  NORMAL  CC:0.9
RFL  EFF:60   FT:0
CLEAR(3)  X,Y:19,36  CORPS:SYKES
```

The first page display shows that the Union unit, Vincent – A (represents the 20th Me and 83rd Pa), is INFANTRY with 649 men. The unit is not disrupted, has 9 ammo points, is plotted for melee, and has a morale of 60. The unit is plotted for priority fire at square 18,36 (the unit will automatically fire on this square when the combat phase begins). It is in normal mode, has 7 operation points, is facing direction 4 (west), and is plotted to advance (toward grid square 18,36). The unit is on a clear square with an elevation of 3 and is at grid square 19,36.

The second page display shows that the Union unit, Vincent – A, is INFANTRY with 649 men. The unit has a fortification value of 0, is in the normal mode, and has a command and control value of 0.9. Its weapon type is rifle, effectiveness is 60, and fatigue is 0. The unit is on a clear square with an elevation of 3 on X,Y coordinates of 19,36 and belongs to Sykes' V corps.

Figure 6.3 shows how units are represented on the screen. The right column displays the units under the symbols option while the left column shows the units as icons. In the figure "One" Infantry unit is the A or B subdivision of an infantry brigade. When playing under the icons option you must access the unit to determine if an infantry unit is in normal or column mode or an artillery unit is limbered or unlimbered.

As in the game *Thunder at the Crossroads*, a set of victory conditions determine the winner and loser at the end of each game. The victory conditions are based on a system of victory points awarded for seizing key terrain objectives and inflicting a certain number and type of enemy casualties. The Confederate and Union flags in Figure 6.1 illustrate the terrain locations each side receives victory points for if held. Each terrain objective is worth 1000 points. For example, the Confederate player receives 1000 points for seizing Little Round Top (grid square 19,36). Players also receive victory points by inflicting losses on their opponent according to the following point values:

- 1 point per infantryman
- 2 points per cavalryman
- 100 points per brigade leader
- 300 points per division leader
- 500 points per corps leader
- 100 points per artillery gun

One weakness in the awarding of the victory points is that it does not take into account the reputation of the leader involved. For example, each corps commander lost is the equivalent of 500 Infantrymen lost. Perhaps this is true of Generals Reynolds and Hancock but it could be argued that General Sickles should be a bit lower.

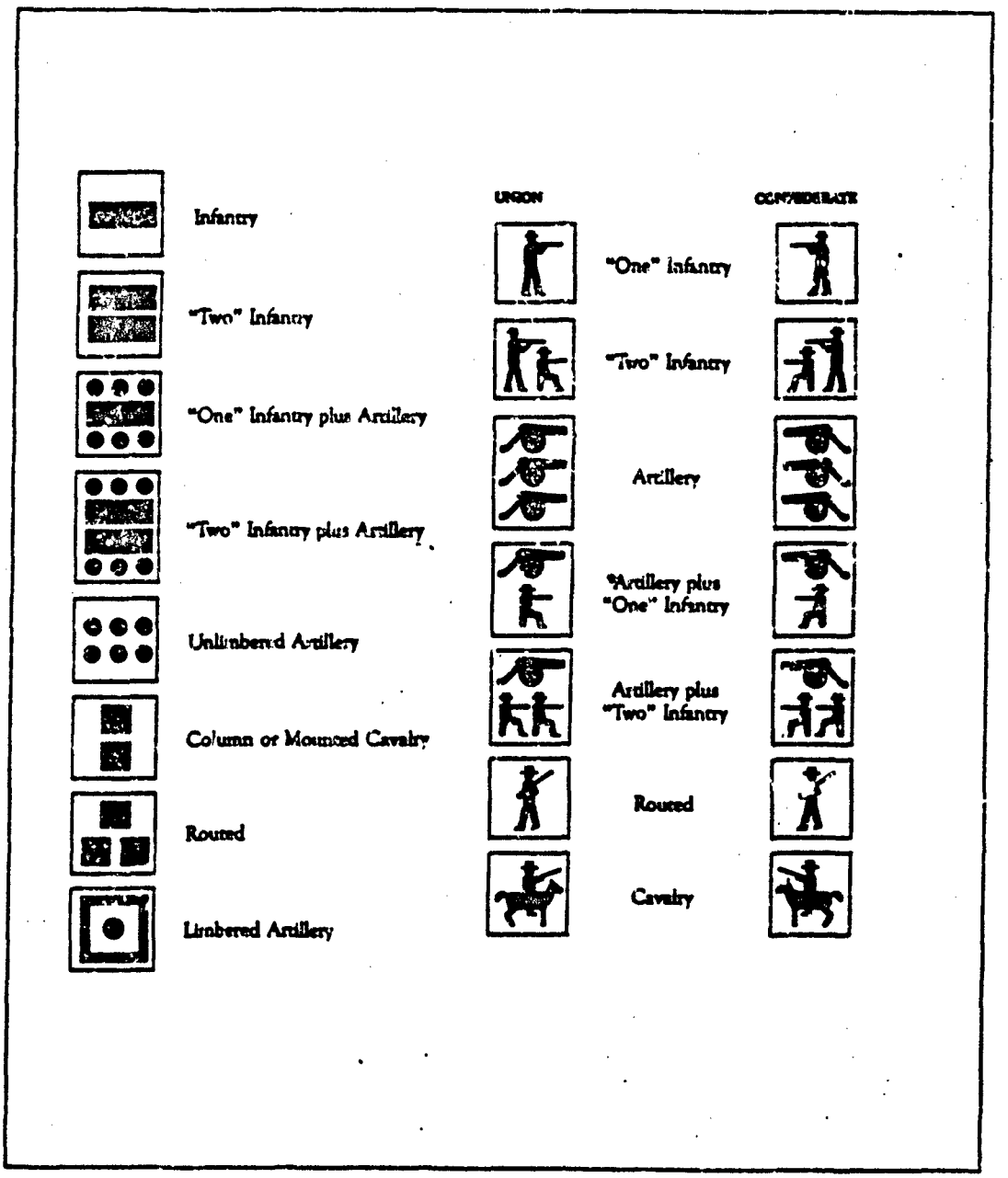


Figure 6.3. Representation of Units

The above numbers are multiplied by 1.5 for infantry and cavalry if captured. The leader loss points are multiplied by 2 if a leader is captured. The increase in score of a captured soldier could take into account any intelligence gained from the individual. The scores are computed for both sides and then the Confederate score is subtracted from the Union's score. The resulting number corresponds to a victory level much the same as *Thunder at the Crossroads* (23:10).

6.6 Combat Processes

This section discusses the techniques used in *Gettysburg: The Turning Point* to simulate the combat processes of command and control, movement, combat, and combat service support. An analysis of the combat processes of a model provides insights into how well the basic assumptions of the model contribute to its ability to replicate (or failure to replicate) the actual battle. Another important reason to analyze the combat processes of each model is to avoid a possible mistake of drawing a conclusion about a particular driver in the battle which may not be from the historical situation but rather an inevitable outcome produced by the model's basic assumptions. I will discuss how the model simulates each process, the effects it has on the other processes, and then the strengths and weaknesses for each. I will discuss the command and control process first.

6.6.1 Command and Control. The command and control process in *Gettysburg: The Turning Point* is perhaps the weakest modeled portion of the wargame. This is not surprising however, considering the difficulty in modeling command and control and the decision making process of leaders. The computer assigns a unique command and control rating to all units at the beginning of each game turn (one time per hour). The command and control rating becomes one of several linear modifiers to determine combat outcomes. For the basic and intermediate level games, human interaction is almost non-existent, the computer assigns a random number between 0.9 to 1.2 to each unit as the command and control rating. In the advance game, the

computer assigns the command and control rating as a function of the distance to a unit's higher level commanders, the leaders proficiency ratings, and another random number. The range of the command and control ratings for the advance game are from 0.5 to 1.5. A unit will have a proportionately lower or higher command and control rating the farther or closer away it is from its leaders.

The command and control rating affects four areas: the unit's strength, operation points, ammunition resupply, and chance of firing during low visibility. The rating modifies a unit's strength by multiplying the number of men by the rating. For example, in the fire combat example in Section 6.3.2, a 100 man unit with a 1.3 command and control rating attains the strength of a 130 man unit during calculations (100 X 1.3). A unit's rating also determines the number of operation points it receives. The number of operation points is proportionate to the rating. Units with high ratings (1.2 – 1.5) earn 12 points while a unit with low ratings (0.5 – 0.6) receive 6 points. The third effect of a unit's command and control rating is on ammunition resupply. The ability of a unit to rally and resupply with ammunition increases as its command and control rating increases. The final effect the command and control rating has on a unit is on firing during periods of limited visibility. As the command and control rating increases the chance that a unit will fire increases.

A strength to the method of modeling the command and control process is the simplicity. If players are not concerned with this aspect of the battle, the command and control variables reduce to one number that is given. Players can anticipate the effects the rating will have on other processes.

The command and control process has several weaknesses. First, I did not get any feeling for the command and control difficulties due to the lack of human interaction in determining each rating. Second, there is little distinction made in the command and control ratings among units that had outstanding leaders compared to units with poor leaders. The basic and intermediate games modeled command and control as a random number. In the advance game a unit that is a certain

distance to its poor leaders could have a higher rating than a unit that was the same distance away from its outstanding leaders because of the random numbers. Fourth, there is no ability for players to account for orders issue, or initiative. Overall, the poor modeling of the command and control process left out an important aspect of combat ... leadership.

6.6.2 Movement. Players move their units by pressing the computer keys. A unit can move in eight directions: vertical, horizontal, and diagonal. Moving costs operation and fatigue points based on the terrain and the unit's activity. Each player has two movement phases per hour. For example, a dismounted infantry unit in column with 10 operation points can move 4000 yards per hour on a road (1 operation point per 200 yards) but only 800 yards per hour in the woods (5 operation points per 200 yards). Changing a formation, mounting/ dismounting the cavalry, or limbering/unlimbering artillery costs operation points and effect the ability of a unit to move.

Units have the ability to stack. Stacking means that more than one unit can occupy the same grid square. However, there are certain restrictions. First, up to two infantry or cavalry units may occupy a square. This equates to a manpower density of one brigade per 200 yards. Second, the square may have an additional artillery unit. Third, at the cost of additional operation points, a unit can move through an already stacked square but it cannot stop (23:8).

A strength to the modeling of movement in the model is the ability to move in any direction. If a player does not like the move, he can abort the move provided he did not access another unit in the interim. It is similar to a common rule among games that you can take back a move as long as you keep hold of the playing piece. This ability is helpful when considering several routes.

The major weakness to the movement process is that it failed to replicate the historical movements of many of the key units. The costs to move cross country or

in the woods were too large. Two examples illustrate this problem. First, I tried to duplicate Longstreet's movement into his attack position but could not get the units there in time to start the battle. I eventually moved the units down the Emmitsburg road in what would have been full view of the Union. Second, the movement costs to travel in the woods and up slopes were too large. In the model, Law A (representing the 15th and the 47th Ala) took 1 1/2 hours to reach Vincent's brigade on Little Round Top. However, most historical accounts place the time about 45 minutes. The game time limit complicated the movement problem. Not only were the units slow to move but at the end of the 7 pm game turn, the computer ended the game regardless of the situation.

6.6.3 Combat. The model breaks the combat process into the following six phases:

- Defensive Artillery Fire Phase
- Offensive Artillery Fire Phase
- Defensive Fire Phase
- Offensive Fire Phase
- Defensive Melee Fire Phase
- Melee Phase

Line of sight, range and visibility determine whether one unit engages another. Players can view the grid squares a unit has the weapons range and line of sight to by pressing "V" once they access the unit. Features that can affect line of sight include: terrain elevation changes, woods (represent a 30 foot elevation change), towns (20), and a unit (5). For example, two Infantry units separated by one grid square that is designated as woods could not engage each other. During the 7am and 5, 6, and 7 pm game turns visibility falls to 60%. During the periods of limited visibility each unit has a random chance of not firing according to the formula:

$$NOFIRE = 120 - (COMMANDCONTROL * 20) - \left(\frac{morale}{3}\right)$$

(23:9).

For example, a unit with a command and control rating of 0.8 and a morale rating of 90 will have 74 % chance of not firing. Most of the units in the game had a morale level around 75 before casualties (which would lower morale). These units would have a 79 % chance of not firing. The NOFIRE formula is excessive. The formula is suppose to model periods of limited visibility. However, one could argue that during 5, 6, and 7 pm in Pennsylvania during July it is still clearly light enough outside not to hinder firing.

A unit inflicts casualties on another unit based on its fire and strength modifiers (described in the unit attribute section). The back of the map card contains a complete listing of modifiers along with their range of values. The applicable modifiers are multiplied together along with the units strength to determine a aggregated combat strength. The amount of casualties is determined by taking the number of casualties per 100 firers from the weapons table and proportioning it to the units combat strength. Although this sounds complicated, the computer resolves combat engagements in seconds. The computer generates a random number within a range from 0.9 to 1.1 to induce the only unknown variability.

The following example will illustrate the combat results along with the predictability of combat outcomes. Refer to table 6.7. The known column reflects those conditions that a player is given or could look up. A firing unit with the conditions below would receive the modifier indicated in the Total row (all modifiers multiplied together). A player can then obtain a fairly accurate estimate of how many casualties he would inflict. The three options illustrates the narrow range of outcomes based on the random modifier. A unit with 1000 men would fire with a strength

of: Option A = 160 (1000 X .16); Option B = 180 (1000 X .18); and Option C = 200 (1000 X .18). According to this example, a unit equipped with rifles at a range of one grid square would inflict a narrow range of outcomes. The outcomes would range from a possible 9 casualties (Option A), to 12 casualties(Option C).

Table 6.7. Combat Results

Known	Inputs	Options A	B	C
Yes	Firer has less than 6 operation points	.75	.75	.75
Yes	Target is in the woods	.80	.80	.80
Yes	Target is on higher elevation	.80	.80	.80
Yes	Firer is in column mode	.50	.50	.50
Yes	Target has carbines	.80	.80	.80
Yes	Firer has 75 effectiveness rating	.75	.75	.75
Yes	Firer has a fatigue level of 15	.85	.85	.85
Yes	Firer has a leader bonus of 15	1.15	1.15	1.15
Yes	Firer has a command and control of 1.3	1.30	1.30	1.30
No	Random modifier	.90	1.00	1.10
	Total	.16	.18	.20

Each of the input values could be a different value based on the particular situation. For example, if the unit had 6 or more operation points the linear modifier would change to 1. Targets in woods, higher elevations and towns receive a value of .8 whereas other targets remain 1. If the firer was in normal instead of column mode the modifier would be 1. The effectiveness remains constant for the unit throughout the game. The fatigue modifier is a function of: (1 - Fatigue)/100. The leader bonus and command and control rating are given in the game. The random modifier assumes a value between .9 and 1.1.

6.6.4 Combat Service Support. Resupply activities occur automatically during every odd number hour game turn(23:9). This alleviates the player from having to plan any resupply efforts. The weakness to this method is that it does not model the problems of a unit running low or out of ammunition such as when Chamberlain ordered a bayonet charge because his unit was out of ammunition.

6.7 *Model Characteristics*

This section discusses the five model characteristics of resolution level, learning time, playing time, documentation, and flexibility and how each applies to the game *Gettysburg: The Turning Point.*

6.7.1 Resolution Level. Although the line of distinction between high versus low resolution is sometimes nebulous, I would consider the game to be aggregated based on the mathematics of the aggregated entities.

6.7.2 Learning Time. The learning time for the model will be different from person to person based on each individuals experience with computer wargames. I played the game for about 9 hours before I felt comfortable with the game system well enough to begin playing the research scenarios.

6.7.3 Playing Time. The playing time is nearly a 1 to 1 correspondence with real time, each game turn took about 45 minutes. This time decreases significantly if the computer plays one side. On the other hand, the playing time increases slightly if two players alternate turns.

6.7.4 Documentation. The documentation was easy to understand, complete, and had numerous examples.

6.7.5 Flexibility. The model was not flexible. The model lacked any ability to "magic move" any unit from one location to another. Units appear on the screen according to their historical arrival times and any movement costs operation points. The lack of flexibility made playing any type of "what if" scenario difficult.

6.8 *Results of the Research Objectives*

6.8.1 Introduction. This section describes the results of the research objectives:

Table 6.8. Model Characteristics

CHARACTERISTIC	EVALUATION
Resolution level	combat and maneuver conducted as A and B units for each brigade
Documentation	complete, not very complex and numerous examples
Learning time	a reading of the rules and an ability to conduct model play required 9 hours
Playing time	depended on scenario and experience, 45 minutes per game turn, faster if the computer played one side
Flexibility	poor, restricted to historical play, not very adaptable for "what if" scenarios

- To compare the combat outcomes of the battle of Little Round Top with the results obtained from a commercial model
- To determine what changes are required in the model to make it more representative of the historical combat
- To determine the sensitivity of the combat outcomes by exploring other "what if" scenarios, given a good relationship between the model and the historical battle.

The first subsection outlines the assumptions used for the model execution. The next three subsections discuss the research objectives. The analysis includes a discussion of how each battle unfolded and how the results compare to the measures of effectiveness. The game results provide many insights into the historical battle as well as the combat modeling process.

6.8.2 Assumptions. Prior to the discussion of the research results, it is important to understand how the assumptions affected the game play. I made five assumptions/ adjustments to the wargame, *Gettysburg: The Turning Point*, so that the model could reflect the initial conditions of the battle of Little Round Top. The assumptions/ adjustments were in five areas:

- The initial game set up
- The unit allocation
- The routes to the initial positions
- The Confederate initial positions
- The attack time

For continuity, each scenario started with the same game set up. I used a maximum number of game options and established the game as close to the historical conditions as possible. In relation to the playing options and conditions, the game I developed was as follows:

a. new game
b. Union: Human
c. Confederate: Human
d. Game level: Intermediate
e. Units: Non - hidden
f. Time: No time limit
g. Screen: RGB
h. Unit display: Symbols
i. Cav: No Cavalry
j. Level of Play: 3
k. Union Arrival: 3
l. Confederate Arrival: 3
m. Union Ammo: 3
n. Confederate Ammo: 3
o. Second Day Scenario: July 2, 1863

The method used to represent units in the wargame caused one obstacle to recreating the battle. The wargame modeled brigades into A and B units. Each

modeled unit was the combination of at least two regiments. I allocated the historical regiments into the A and B units using two criteria. First, I grouped together units that fought adjacently. Second, I tried to combine the strengths so that each was relatively close.

The table below shows the similarity in end strength of the game's aggregated units and the historical units I chose them to represent:

Table 6.9. Allocation of Units

Unit in Game	Model Strength	Units Represented	Historical Strength	Difference
Robertson B	824	4th Tx	415	
		5th Tx	409	
		Total	824	0
Law A	845	15th Ala	499	
		47 th Ala	347	
		Total	846	model -1
Vincent A	649	16 Mich	263	
		44 NY	391	
		Total	654	model -5
Vincent B	687	20 Me	386	
		83 Pa	295	
		Total	681	model +6

In some instances the actions and combat strengths of an A or B unit did not always coincide as well as the units it was to represent. For example, the units represented by game unit Law B (combined strength 1084) during the game would consist of the historical units of the 44th, 48th, and 4th Ala. These units fought at three different locations. The 44th attacked into the Devil's Den, the 48th wound up on the left of the 4th Tx and attacked the 16th Mich (part of Vincent A) while the 4th attacked the 83rd NY (part of Vincent B).

The problem became, what to do with Law B. Rather than weight one part of the attack much greater than the historical force ratios, I kept the unit out of the action on Little Round Top. The Confederates sustained casualties along the attack route prior to engaging Vincent's brigade on Little Round Top. Therefore if

anything, the ratio would be the historical strength or below and not substantially greater as shown in Table 6.10. The effect was to have each half of Vincent's brigade attacked with one less regiment. I tried to make up for this by ensuring the units that did attack Little Round Top did so at full strength.

Table 6.10 compares the historical force ratios on Little Round Top versus the wargame force ratios and the effect of leaving Law B out of the battle (only applies to scenario 1; recreating the battle). As the table indicates, the force ratios change

Table 6.10. Historical Versus Wargame Force Ratios

	Confederate	VERSUS	Union
Historical Units	4th, 15th, 47th Ala		20th Me, 83rd Pa
Historical strength(sum)	1192		681
Historical force ratio	1.7:1		
Modeled unit	Law A		Vincent B
Modeled strength	845		687
Modeled force ratio	1.2:1		
Effects of adding Law B			
New modeled strength	1929		681
New force ratio	2.8:1		
Historical Units	4th and 5th Tx, 48th Ala		16th Mi, 83rd Pa
Historical strength(sum)	1198		654
Historical force ratio	1.8:1		
Modeled unit	Robertson B		Vincent A
Modeled strength	824		649
Modeled force ratio	1.3:1		
Effects of adding Law B			
New modeled strength	1908		649
New force ratio	2.9:1		

dramatically by adding Law B to either side of the attack. The result is to increase the force ratio to nearly 3:1. The 3:1 advantage is a figure commonly used as a general rule of thumb ratio necessary for an attacker to achieve success.

Once I allocated units, I then established each unit's initial location as close to historically accurate as possible. I made several assumptions and adjustments

to the game play to do this. Due to the nature of the game, the units arrived on the battlefield at specific entry points corresponding to their historical arrival times. From the entry points I then moved the units into their initial game locations. The Union forces entered on the Baltimore Pike (grid square 35,35). Time was not a factor in the Union move. However, the Confederate units entered on the Chambersburg Pike (grid square 0,5). I tried to recreate Longstreet's movement into his attack position, but due to how the game modeled cross country movement, the units did not get into position until after 4 pm. This was unacceptable because the historical battle started at 4 pm. I then cleared a route along the Chambersburg Pike and the Emmitsburg road for the Confederate units to move on. The units arrived in position at 3 pm.

Table 6.11 and Figure 6.4 show the initial locations for the units:

Table 6.11. Initial Locations for *Gettysburg: The Turning Point*

North			South	
Unit	location		Unit	Location
III Corps Art A	14,34		Henry Art	11,35
III Corps Art B	15,35		Cabell Art	11,36
III Corps Art C	16,36		Robertson A	11,37
Ward A	15,36		Robertson B	11,38
Ward B	15,36		Anderson A	9,37
Vincent A	19,36		Anderson B	9,38
Vincent B	19,37		Law A	11,39
V Corps Art B	20,34		Law B	11,39
Weed A	22,35		Benning A	9,40
Weed B	22,35		Benning B	9,39
Fisher A	22.36			
Fisher B	22,36			

The final adjustment to the game set up was to begin the attack early. The game scenario attack commenced at 3 pm whereas most historical accounts place the actual attack at 4 pm. I started the attack early to provide one more hour of combat. This is a reasonable assumption in the model because the game shut off

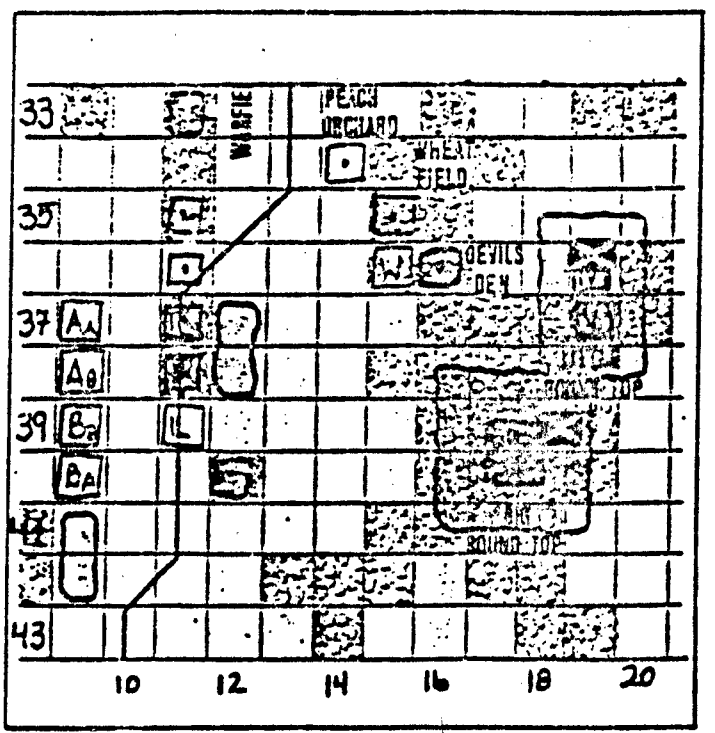


Figure 6.4. Initial Locations

after the 7 pm game turn while the actual battle extended past that hour. None of the assumptions appeared to jeopardize the historical basis of the battle.

With the game's initial conditions set I began to play the first scenario; recreating the Battle of Little Round Top.

6.8.3 Compare the Combat Outcome of the Battle of Little Round Top to the Historical Game Scenario. The comparison of the model to the actual battle is in two parts. The first part is a synopsis of the general flow to the wargame. The second part is the comparison to the measures of effectiveness regarding time lines, force ratios, and casualty data. The events of the model scenario are very similar to the actual historical events. For a comparison of the historical events see tables 3.1 and 3.2. Figure 6.5 shows initial locations of the units and the Confederate axis of advance.

Hood's division began the attack at 3 pm. Law's A and B units with Robertson B moved east towards Big Round Top. Robertson A, Benning A and B, and Anderson A and B attacked Ward's brigade in the Devil's Den. Law A moved across the open fields, entered the woodline west of Big Round Top and proceeded to scale the hill. Robertson B went half way up Big Round Top and then began moving laterally towards the northeast. Law B cut behind Law A and Robertson B and attacked north toward Smith's battery in Devil's Den.

I used two Confederate artillery units in support, LTC Henry's unit fired on to Little Round Top while LTC Cabell's unit fired at Ward's brigade.

The Union Forces of Ward's brigade began their fire with artillery and small arms as the Confederates launched their attack. Due to line of sight limitations, Law A and B, and Robertson B moved to the woodline west of Big Round Top untouched.

At 4 pm Hood's division moved on line (minus Law A and Robertson B) and attacked Ward's brigade in the Devil's Den. The Confederate attack began to overwhelm the Union brigade. Ward's effectiveness status dropped and the computer

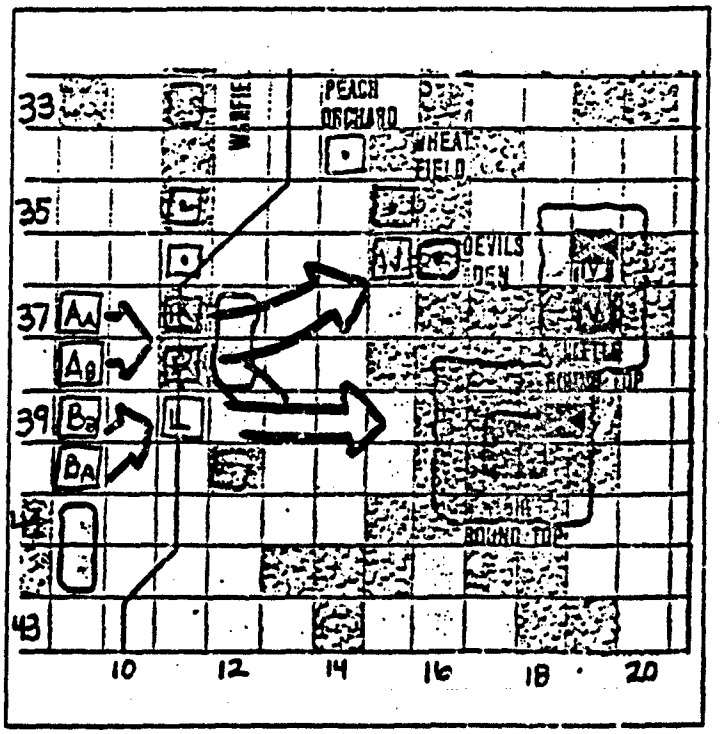


Figure 6.5. Scenario 1: Attack Axis

automatically placed him in a retreat. Ward's brigade and an artillery unit which portrayed Smith's battery, fell back to the north. The brigades of Anderson and Benning pushed the Union forces through the Devil's Den towards the Wheatfield.

While the attack developed in Devil's Den, Law A reached the top of Little Round Top. Robertson B continued his advance around Big Round Top to the northeast in the direction of Little Round Top.

Vincent's brigade was in position on Little Round Top. The brigade had line of sight to the action in the Devil's Den but could not fire due to weapons range limitations.

I stopped play of the Devil's Den battle after the 4 pm game turn. At this point in the wargame, the Confederates pushed Ward north and opened the Plum Run valley. To model the battle of the Wheatfield would expand this study and increase the number of playing units considerably. I felt this was a good place to stop as a reference to how the other scenarios developed the battle for Devil's Den. In the historical battle, the Confederates cleared the way for a two pronged attack when they forced the Union forces out of the Devil's Den. I was interested in how the other scenarios, with the changing of force ratios, played out that portion of the battle. If the other scenarios also pushed Ward out of the Devil's Den, this could provide some insight into the battle and suggest other questions to ponder. I then concentrated on the battle as it developed on Little Round Top.

At 5 pm, the attack on Little Round Top continued very similar to the historical battle. Robertson B attacked Vincent A from the West as Law A attacked Vincent B from the South. Vincent's brigade repelled the initial attack and the computer automatically moved both Confederate units back one square each. Vincent A continued to fire at Robertson B. However, Vincent B lacked line of sight with Law and could not engage.

During the movement phase of the 5 pm game turn I moved Robertson B down to Devil's Den and then north along Plum Run. The move simulated the move of the 4th, 5th Tx and the 48th Ala. At the same time I moved Weed A (simulating O'Rorke's move) toward Little Round Top. I wanted to recreate the meeting engagement when the 4th 5th Tx and the 48th Ala hit the 140th NY (O'Rorke's regiment) head – on.

During the 6 pm game turn Robertson B attacked Vincent A from the northwest similar to when they hit the 16th Mich. Vincent A retreated to the same square as Vincent B (the computer did this automatically). This was reminiscent of the 16 Mich falling back. However, in the actual battle the 16th went back over the hill to the east. Weed A (O'Rorke) moved onto Little Round Top and engaged the attacking Confederates.

On the southern part of Little Round Top Law A maneuvered and attacked Vincent B a second time. Once again Law was repelled and the computer automatically moved him down into the Plum Run Valley.

For the 7 pm game turn, Robertson continued his attack on the northern part of the slope versus Weed B. I moved the second half of Weed's brigade onto Little Round Top. Law A once again attacked Vincent B on the southern part of Little Round Top and for the third time was pushed back. The game ended with Robertson continuing the attack on the northwest slope of Little Round Top, Law in the Plum Run Valley, and the Union forces of Weed and Vincent's brigades secure on Little Round Top.

There were many similarities between the actual battle and the wargame. The time lines between the events of the battle and the results of the model were uncanny. What impressed me the most was the computers automatic retreat of the Confederates attacking forces and how closely it resembled the back and forth assaults of the battle. As the game developed, the events during the game modeled the historical battle very closely.

The second quantitative method used to analyze the wargame was the force ratios. As discussed in previous sections, the force ratios favored the Union on Little Round Top. Therefore, one would expect the results to occur as they did. The initial force ratios were roughly the same. Robertson B versus Vincent A was 1.8:1 for the historical battle compared to 1.3 :1 for the model. Law A versus Vincent B was 1.7:1 for the historical battle compared to 1.2:1 for the model. The game clearly gave Vincent an advantage on the defense. The other two scenarios changed several of the force ratios at the point of attack and would provide further insight into the battle.

The final quantitative measure used in the examination of the battle was the number of casualties. I was not as concerned for a comparison of the exact numbers as I was for the trends and percentage change when comparing the model to the battle. Table 6.12 shows how the strengths of Robertson B and Vincent A changed during the game compared to the historical battle. During the historical battle Robertson's forces suffered casualties at a rate of about 1.9 to Vincent's 1. However during the game Robertson suffered casualties at a rate of 3.1 to every 1 of Vincent's.

Table 6.12. Casualty Results of Robertson B Versus Vincent A

Unit	Start Strength	Game Losses	Game % Change	Historical Losses	Historical % Change
Robertson B	824	133	16.0	323	39.2
Vincent A	649	43	6.6	171	26.1

Figure 6.6 shows how the strengths of Robertson B and Vincent A decreased over time. You can see the effect of Weed(-) (O'Rorke) entering the battle at 6 pm. Vincent's strength stabilized primarily because Weed(-) picked up the fight.

Table 6.13 shows how the strengths of Law A and Vincent B changed during the game compared to the historical battle. During the historical battle Law's forces

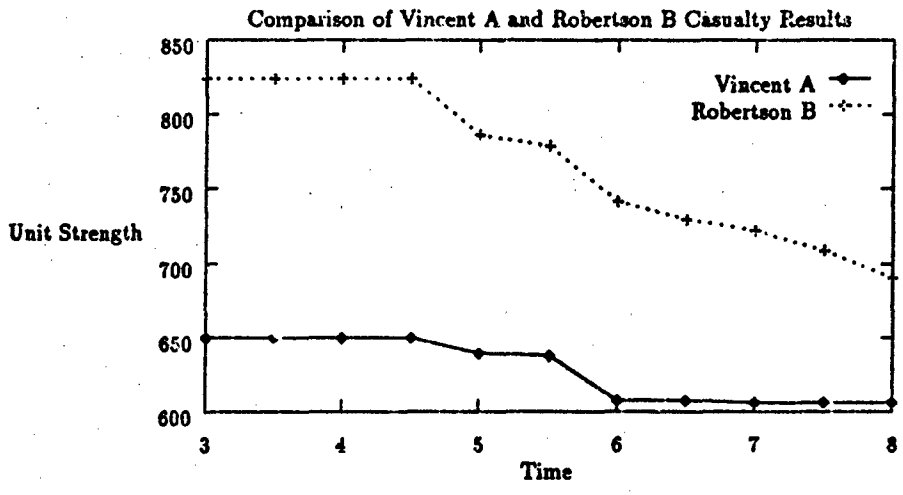


Figure 6.6. Casualty Results of Robertson B Versus Vincent A

suffered casualties at a rate of about 1.2 to Vincent's 1. However during the game, Law suffered casualties at a rate of about 3.3 to every 1 of Vincent's.

Table 6.13. Casualty Results of Law A Versus Vincent B

Unit	Start Strength	Game Losses	Game % Change	Historical Losses	Historical % Change
Law A	845	160	18.9	215	25.4
Vincent B	687	48	7.0	180	26.4

Figure 6.7 shows the decreasing strength of Vincent B and Law A over time. The graph of Vincent B remained relatively constant during most of the battle. The reason was because the NOFIRE formula went into effect during the 5 pm game turn. Consequently, in several engagements Law did not fire. The decrease in strength during the 7 pm game turn occurred because I moved Vincent B out of their positions and attacked Law similar to Chamberlain's bayonet charge. The table below compares the losses in the wargame to those during the actual battle. The graph shows the strengths over time of the two engaging units.

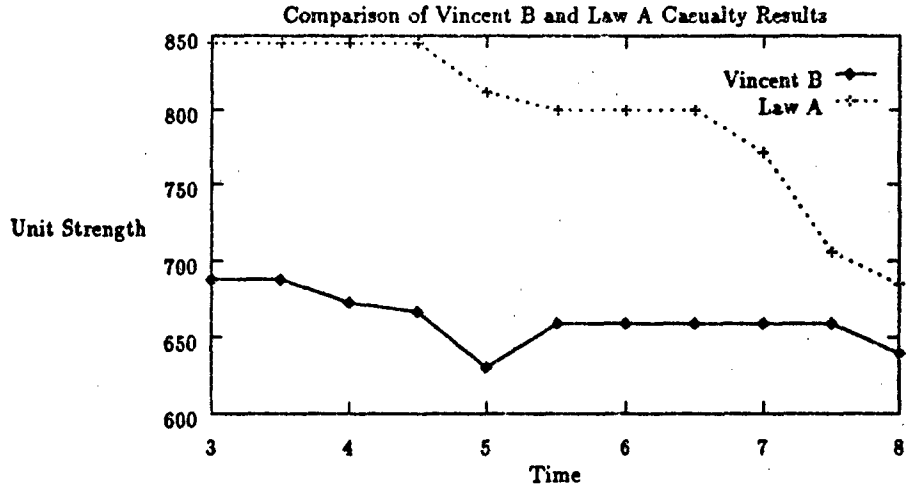


Figure 6.7. Casualty Results of Law A Versus Vincent B

The results of comparing casualty numbers indicate that the model consistently had lower casualty numbers per engagement than the actual battle. Also, the model attrits the Confederates at a ratio of at least two additional men per Union casualty. The reason for this raises two issues. First, the linear method that determined battle casualties produced a very low number compared to what one would expect during one hour of combat. Second, the NOFIRE formula during the 5, 6, and 7 pm game turns produced an unrealistic effect on the model. During the attack, the Confederate units in several instances did not fire. As Robertson's and Law's units suffered casualties, their morale decreased to a point where neither had a very high chance of firing. For example, at 5 pm the visibility index went to 60 % and the NOFIRE formula went into effect. At that point in time, due to casualty losses and fatigue points, Law's morale was 56. Law therefore had an 81 % chance of not firing. At 6 pm after suffering more casualties, Law had an 83 % chance of not firing. At 7 pm Law recovered some fatigue points to increase his morale however his brigade still had a 79 % chance of not firing. The wargame's attempt to simulate periods of limited visibility was unrealistic.

The results of the first research objective showed the difficulty in modeling combat. The game is a very good example of being able to model the "physics" of combat. The items such as movement, line of sight, and engagements occurred based on simple formulas. If the game had the ability, one could change some of the parameters to try different scenarios. However, the game also shows the difficulty in modeling combat decisions and being able to quantify the fortitude of the soldier. The computer enables a player to play the game quickly, but, because of the lack of command and control input, I did not get a good sense of those type of "fog of war" issues.

6.8.4 Determine What Changes are Required in the Model to Make it More Representative of Historical Combat. *Gettysburg: The Turning Point* requires several changes to make it more representative of historical combat. I will only present a list of the changes I have already discussed in the previous subsections. The changes addressed so far were:

- Change the initial set up
- Change the movement costs for an attacking force
- Extend the game time
- Increase casualties per engagement
- Decrease the advantage given to the defense, especially in the absence of artillery support
- Increase the threshold value before units retreat or get routed
- Change the NOFIRE equation to increase the chances of a unit firing

Another change to the model is more player input into the command and control process. Command and control in the current model reduces to a random number whose range depends on the game level chosen. With more player input into the command and control aspects of the battle such as the orders process, and

"fog of war" issues might portray some of the confusion that was in the minds of the commanders and provide players a better feel for the battle. The computer allows players to play fast, alleviating the dice rolls and table look ups. This sometimes has the effect of losing sight of what is happening on the ground.

The problem with adding enhancements to any game is that they tend to slow the game down. The dilemma facing a game designer becomes how to balance the level of detail of the game with its playability and player enjoyment of the game. The balancing point for commercial wargames is determined by the marketplace.

6.8.5 Determine the Sensitivity of the Battle Outcome to Different Battle Alternatives. This section will analyze the results of the game play for the last two scenarios:

- Scenario 2: Law' brigade attacks Chamberlain from the flank
- Scenario 3: Benning's brigade follows Law during the attack

The scenarios had five similarities. First, both scenarios started with the same initial conditions as scenario 1. Second, both attacks started at 3 pm. Third, they had the remaining units of Hood's division attack Ward's brigade in the Devil's Den. Fourth, both used the same attack axis for Law B, the lead unit. Fifth, both scenarios had the initial point of contact the southeast corner of Vincent B, representing the rear of the 20th Maine.

The following paragraphs will outline the event sequence for each scenario and how each scenario compared to the historical situation in respect to time lines, force ratios, and casualty rates. The first scenario discussed is scenario two.

6.8.6 Scenario 2: Law's Brigade Attacks Chamberlain from the Flank. In this scenario Law's brigade attack axis curved south of Big Round Top and hooked around to hit Vincent B (20th Me and 83rd Pa) from the rear. The remainder of

Hood's division attacked Ward's brigade and Smith's battery in the Devil's Den (Figure 6.8).

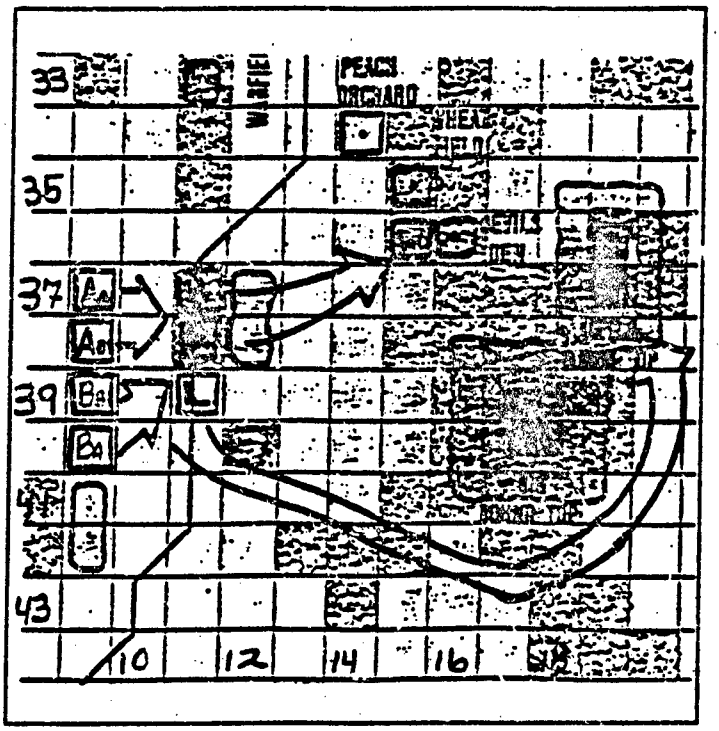


Figure 6.8. Scenario 2: Attack Axis

Hood's division began the attack at 3 pm. Robertson A and B, Anderson A and B, and Benning A and B attacked towards Devil's Den. Law A and B moved southeast into the woodline south of Big Round Top. Confederate artillery from Cabell's and Henry's battalions fired on Chamberlain and Ward respectively.

The Union forces of Ward's brigade began their defense with artillery and small arms fire as the Confederates launched their attack. The Union could not engage Law's brigade because it was out of range.

By 4 pm the Confederates assaulted into Ward's brigade. During the first Confederate combat phase of the game turn Ward's brigade routed Robertson A. Robinson A suffered over 200 casualties. The computer automatically moved him 3

grid squares west, away from the battle and placed him in a routed status. In this status he could no longer perform any offensive maneuver until he reorganized. It normally took 1 game turn for a unit to regain combat effectiveness.

Ward continue to rout Robertson B and Anderson A during the second Confederate combat phase of the 4 pm game turn. Both southern units suffered heavy casualties and were moved back to the west in the same vicinity of Robertson A. Benning's brigade attacked Smith's battery on the high ground of Devil's Den. Law's brigade moved around Big Round Top and was now in position to attack Vincent B (Chamberlain) from the rear. Confederate artillery fire still fell on Little Round Top. The 4 pm game turn ended with the Union forces holding strong.

By 5 pm the Confederate units that attacked Ward's brigade suffered enough casualties to reduce their numbers to a point where they never seriously challenged Ward again. Although they continued to attack during the game, each unit was routed and brought back into the fight several times. This was the first scenario where Ward successfully defended Devil's Den. The remainder of the battle synopsis will concentrate on the battle for Little Round Top.

Law's brigade exchanged volleys with Vincent B. Then Law's brigade (both A and B units) assaulted Vincent B (20th Me and 83rd Pa) and pushed him northeast one square out of position. The 5 pm game turn ended as Law occupied the southern crest of Little Round Top and assaulted the A and B units of Vincent's brigade.

The 6 pm game turn began as Weed's brigade moved to Little Round Top to counterattack. Law A melee'd Vincent A (15th and 47th Ala versus the 16th Mi and 44th NY) while Law B (4th, 44th, and 48th Ala) melee'd with Vincent B (20th Me and 83rd Pa). Law was unable to push Vincent off Little Round Top. Weed eventually made it into the fight and engaged Law with Vincent. At the close of the 6 pm game turn, the fire effects of the Union brigades overwhelmed the confederates. Law suffered enough casualties that the computer placed him in a retreat status.

Law broke contact with the Union brigades and the computer automatically moved him towards Big Round Top to the southwest.

During the 7 pm game turn Law moved from Big Round Top to Little Round Top and once again attacked Vincent's brigade. Vincent's brigade consolidated in the southern portion of Little Round Top and laid down a base of fire to repel the Confederates. Weed's brigade was on the northern portion of Little Round Top but did not engage Law.

The game ended with Ward's brigade in control of Devil's Den and Vincent's and Weed's brigade in control of Little Round Top. Although Law's brigade was in the process of counterattacking, they suffered many casualties. Due to the superior positions of the North (defending on the high ground) and their combat strength, Law's chance of success after that point was remote.

It is difficult to compare the time lines of the fictitious scenario to the actual one. However, there are two events of rough commonality. The first is that this was the first time the Confederates did not push Ward out of Devil's Den. One would think the Confederates would have had a good opportunity to do this because they attacked with three organic brigades.

The second event to compare was the time in which it took the first Confederate unit (in this case Law's brigade) to come in contact with a Union unit on Little Round Top. Law's brigade took 1 1/2 hours to reach Vincent's unit B. This assumes time could be broken down so that the first Union and Confederate maneuver and combat phases occur in the first half hour while the second maneuver and combat phases for both units occur in the second half of an hour in each game turn. Law's brigade took about thirty minutes more going entirely around Big Round Top than they did when they scaled Big Round Top according to history. Although Law's brigade took longer than the historical units, Law took the same amount of time as the attacking units for scenario one.

The second quantitative method used to analyze the wargame was the examination of force ratios. When Law's brigade initially engaged Vincent B the force ratio at the point of attack was 2.8:1 (Law's brigade of 1929 to Vincent B of 681). However, Vincent A quickly reinforced his B unit the next game turn. This brought the force ratio down to 1.4:1 in favor of the Confederates (Law 1817 versus Vincent 1322). As one would expect, Law's attack began to stall once Vincent's brigade reorganized its defense against Law. When Weed's brigade arrived the force ratio then favored the Union 1.6:1 (Vincent 1298, Weed 1484 versus Law 1783). Figure 6.9 shows the engaging force strength for both sides over time.

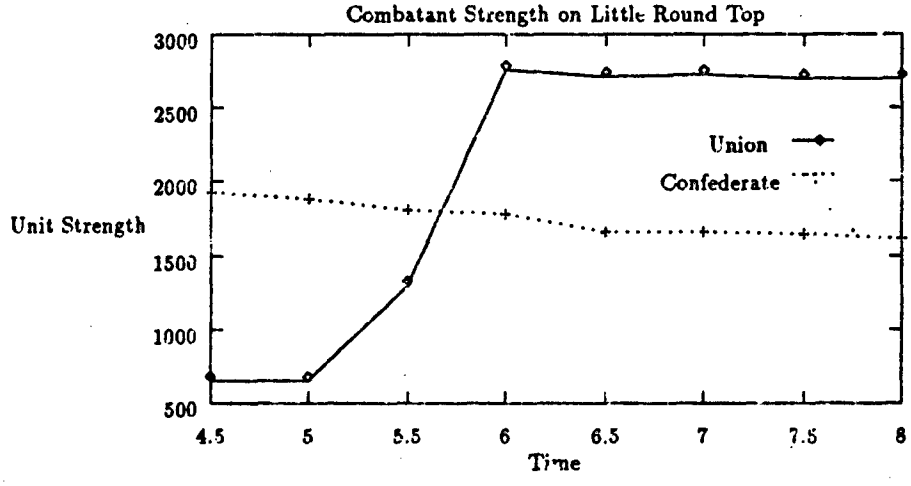


Figure 6.9. Unit Strengths on Little Round Top

One insight derived from looking at the graphs is the effect of the Union's ability to reinforce due to interior lines. This was an advantage the North had over the Confederates throughout the actual battle. The Union's ability to shift forces to the decisive point in time was instrumental in saving Little Round Top during the actual battle just as it was during this scenario. The Confederates did not have that luxury.

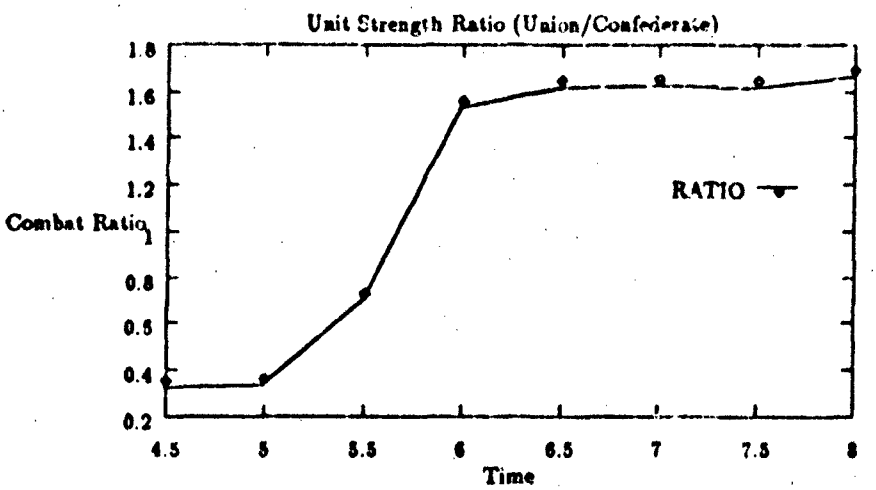


Figure 6.10. Combat Ratio (Union/Confederate) on Little Round Top

Another insight is the effect of massing one's forces. Law attained initial success when he massed his brigade versus Vincent B. However, Law's attack was pushed back to Big Round Top when he had to engage several units and could no longer concentrate his fire on just one unit.

The results of playing the second scenario raised several issues of force ratios and how they changed over time. In the second scenario, Law initially achieved a foothold on Little Round Top and pushed Vincent B (20th Me and 83rd Pa) back. However, as the Union forces reinforced, Law could no longer hold on and was forced off. The third scenario provided more Confederate forces in the attack on Little Round Top. The addition of Benning's brigade to the attack nearly doubled the size of the Confederate attacking force.

6.8.7 Scenario 3: Benning's Brigade Follows Law's Brigade and Attacks Chamberlain From the Flank. In this scenario Law's and Benning's attack axis curved south of Big Round Top and hooked around to hit Vincent B (20th Me and 83rd

Pa) from the rear. The remainder of Hood's division attacked Ward's brigade and Smith's battery in the Devil's Den (Figure 6.11).

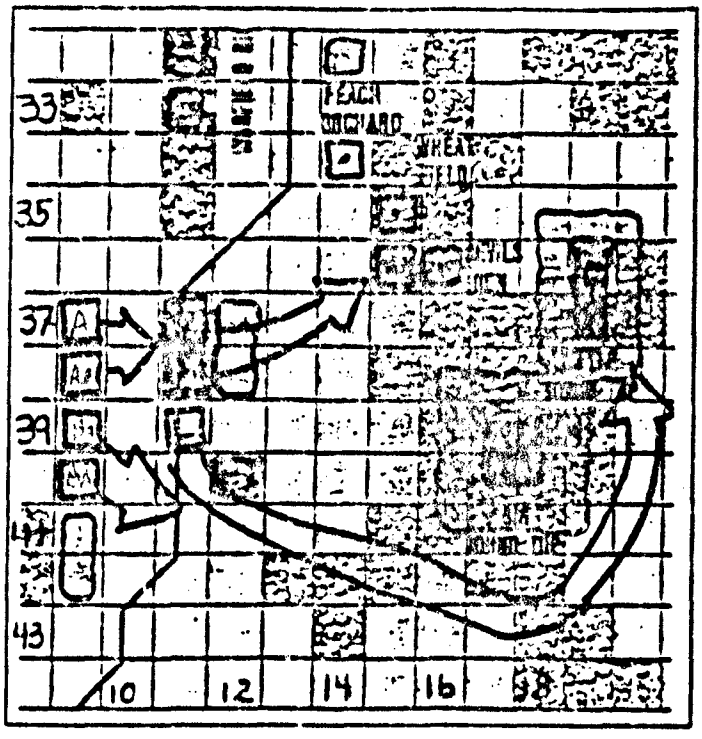


Figure 6.11. Scenario 3: Attack Axis

Hood's division began the attack at 3 pm. Robertson A and B with Anderson A and B attacked towards Devil's Den. Law A and B with Benning A and B moved southeast into the woodline south of Big Round Top. Confederate artillery from Cabell's and Henry's battalions fired on Chamberlain and Ward respectively.

The Union forces of Ward's brigade began their defense with artillery and small arms fire as the Confederates launched their attack. The Union could not engage either Law's or Benning's brigade because both were out of range.

By 4 pm the Confederates assaulted into Ward's brigade. During the first Confederate combat phase of the game turn Ward's brigade routed Robertson's brigade. The Union brigade inflicted over 300 casualties to Robertson A and 250

casualties to Robertson B in the first half hour of the battle. After the second Confederate combat phase of the game turn, Ward also routed Anderson's brigade Anderson A suffered over 160 casualties while Anderson B had 315.

The Confederate units that attacked Ward's brigade suffered enough casualties to reduce their numbers to a point where they never seriously challenged Ward again. Although they continued to attack during the game, each unit was routed and brought back into the fight several times. This was similar to the second in which Ward successfully defended Devil's Den. The remainder of the battle synopsis will concentrate on the battle for Little Round Top.

Law's brigade with Benning following reached the rear of Vincent's brigade by the second Confederate combat phase of the 4 pm game turn. Law B was the first Confederate unit to engage Vincent B while Benning maneuvered into a position to also fire. During the initial volley, Law B received 40 casualties to Vincent B's 17.

During the 5 pm game turn the Confederates formed their assault on Vincent B. Benning maneuvered into position 200 yards (one grid square) east of Vincent B. Law's brigade was 200 yards (one grid square) to the south of the Union troops. The Confederate brigades then assaulted (melee'd) Vincent B. The initial results were not as devastating as I expected. Vincent B lost 32 soldiers.

At 6 pm the Union began to reinforce Vincent B. Vincent A maneuvered to occupy the same location as Vincent B. Weed's brigade began their move towards Little Round Top and by the end of the game turn was in position to engage Law's brigade. The assaults of Law's and Benning's brigades broke Vincent's brigade. After the second combat phase, the Union soldiers retreated down the northeast slope of Little Round Top (computer generated automatically).

During the 7 pm game turn, the Confederate brigades of Law and Benning continued their assault on Weed's brigade on the northern portion of Little Round Top. Benning was pushed back to the south towards Big Round Top. Benning's

forces quickly recovered and continued back to their location with their sister unit. The game ended in a stalemate with two brigades of Confederates occupying the southern half of Little Round Top while the Union had two brigades on the northern half.

As in the second scenario, it is difficult to compare the time lines of a fictitious scenario to the actual battle. However, three events stand out from this scenario compared to the first two. The first was how quickly Ward's brigade routed the attacking Confederate brigades of Robertson and Anderson. In this scenario, Ward routed both brigades in the first two hours of combat. This was only the second time in any of the scenarios that Ward successfully defended the Devil's Den. The second event was the time it took Law to reach Little Round Top. Law used the same rout as scenario two, therefore as you would expect Law took the same amount of time (1 1/2 game hours) this was still twice as long as the time the Confederates used to attack according to the historical battle.

The third significant event is what did not happen. The scenario did not end with the Union in sole possession of Little Round Top. Instead, Law's and Benning's brigades ended in a stalemate with Vincent's and Weed's brigades. The game ended before any conclusive result. The game at that point turned into a battle of attrition. The game ended as Fisher's Third Brigade of Pennsylvania Reserves maneuvered towards Little Round Top. Including Fisher's brigade for the Union could have tipped the balance for the Union.

The casualty results of the third scenario reflect the force ratios on Little Round Top and how they changed over time. Figure 6.12 shows the strengths of both combatants over time during the battle.

The Confederates had a decided edge initially. The two Confederate brigades had nearly a 5:1 advantage. However, Vincent's ability to shift the A unit to support the B unit slowed the attack and provided sufficient time for Weed's brigade to enter the battle.

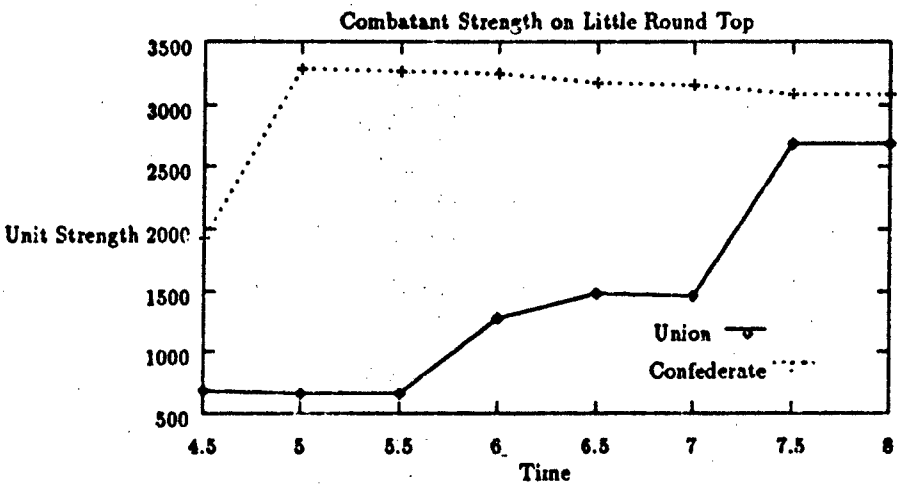


Figure 6.12. Unit Strengths on Little Round Top

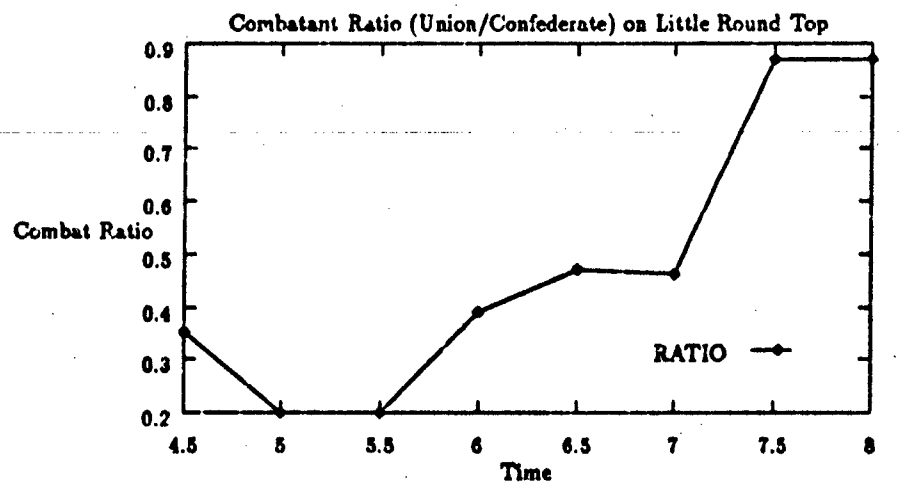


Figure 6.13. Combat Ratio (Union/Confederate) on Little Round Top

An example of the timeliness of the Union's ability to reinforce itself occurred in the second phase portion of the 6 pm game turn (equating it to 6:30). To solely look at the numbers would lose the significance of what happened. On the surface, the Union strength increased by about 200 soldiers. However, at that point in the battle Vincent's brigade was disrupted and pushed off Little Round Top. If Weed's brigade was not in position to immediately pick up the fight the Confederates would have occupied Little Round Top.

6.9 Summary

This chapter provided the model analysis for *Gettysburg: The Turning Point.* Although some parts of the game are open to debate for the purpose of exploring the historical battle and playing "what if" type scenarios the game served its purpose: to open one's imagination and develop insights. The results of the game must be judged on its insights into the battle, not as a precise prediction of what would happen. A model is not a crystal ball but a tool to use to gather insights. If each scenario was played over, the results could be different. Therefore, its not as important to find out what happened as much as it is to find out why it happened.

The first half of the chapter discussed how the game was set up and the methods used to determine combat outcomes. The game used equations with variable parameters to decide combat. This technique allowed the computer to do the work and alleviated the players from the dice rolls and combat look up tables. The computer made the game easier for the players and allowed the game to play smoother. The game also shows the difficulty in incorporating "fog of war" problems such as command and control, combat orders and uncertainty.

Playing the different scenarios offered many insights into the battle. One insight was the Union's ability to reinforce itself at the decisive place in time. This was just as instrumental to the success during the game play as it was in the actual battle. The interior lines of the Union was one advantage the Confederates did not

have. When the Confederates executed the flanking move they initially had enough forces to push back the forces of Vincent's brigade and gain a foothold on Little Round Top. However, the Union was always able to counter with more forces.

Another insight was the importance of Ward's defense of Devil's Den. In the historical scenario the Confederates pushed Ward out of Devil's Den. Robertson B moved into the Plum Run valley and attacked the northern half of Vincent's brigade from the west as Law A attacked Vincent's southern unit. The Union forces held the Confederates long enough for Weed's units to move into position and reinforce. Once the Union forces achieved superior numbers the attrition rates favored the Union and they retained control of Little Round Top.

In the last two scenarios however, Ward successfully defended the Devil's Den. When the Confederates attacked Vincent B (20th me and 83rd Pa), Vincent A was able to move and support. Had Ward lost the Devil's Den a unit such as Robertson's could have attacked Vincent A and fixed him in position. The Union would have lost the ability to quickly reinforce itself and the results could have been different.

VII. Conclusion

7.1 Introduction

As a result of the analysis of the two commercial wargames, *Thunder at the Crossroads* and *Gettysburg: The Turning Point*, I conclude commercial wargames can be used as a tool for historical research. The wargames provide an excellent method to enhance learning about a particular battle. As the figure below shows, the wargames are not an end all but part of an ongoing process. To get the most benefit from the wargames one must have some knowledge of the battle before playing.

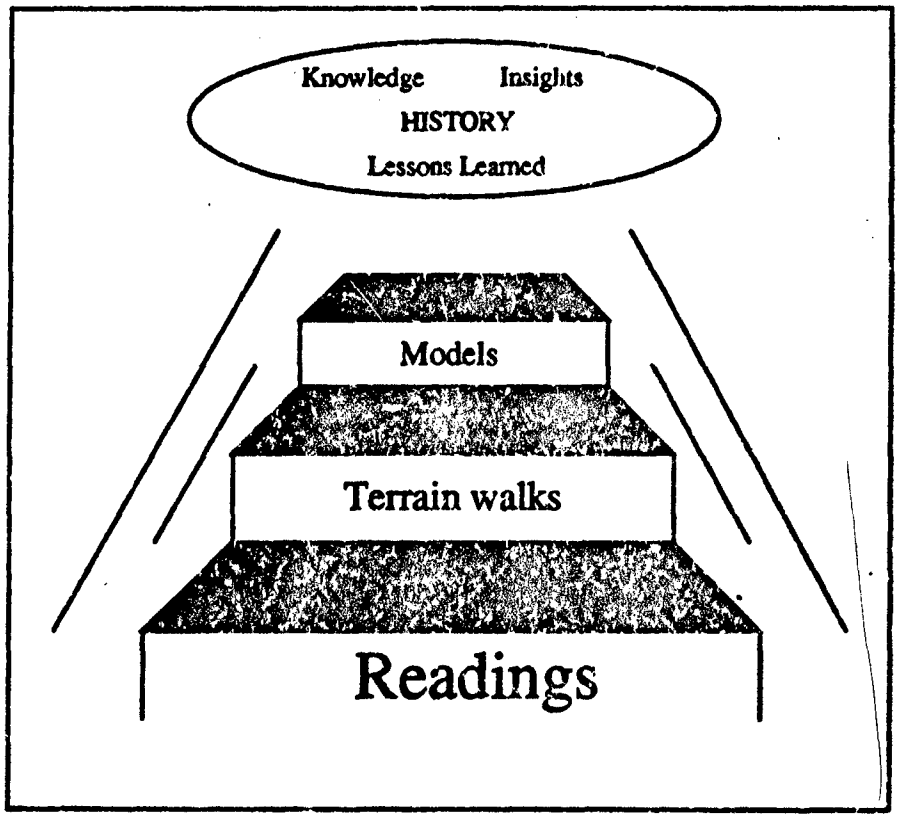


Figure 7.1. Research Process of Historical Battles

Although any of the three steps will allow a person to learn about a particular battle, the synergistic effect of the three combined produce an innovative, exciting, and fun approach. Readings provide the basis of knowledge of the historical event. The terrain walks expand on that knowledge and allow those interested in the battle to walk the ground and see for themselves how the action occurred. The wargames then provide a hands-on tool to develop insights to the battle by either putting yourself into the positions of the actual commanders to replicate the battle or developing your own plans to reveal additional insights.

The remainder of this chapter will summarize the major themes found in each of the three research objectives.

7.2 *Compare the Combat Outcome of the Battle of Little Round Top with the Results Obtained from Two Commercial Models*

Although both wargames modeled combat differently, some trends between the two did occur. One interesting result of replaying the historical battle was that in every instance the Union forces retained control of Little Round Top. Second, a comparison of the casualty results obtained from the wargames indicate that *Gettysburg: The Turning Point* consistently produced less casualties than the historical battle while *Thunder at the Crossroads* produced more. Figure 7.2 shows the percent losses for each side during the battle. The left half of the figure shows the results of the engagements between the Union forces of the 20th Maine and 83rd Pennsylvania versus the 15th and 47th Alabama. The right half of the figure shows the results of the battle on the northern portion of Little Round Top between Robertson's 4th and 5th Texas and Vincent's 16th Michigan and 44th New York. All four results show the same pattern. The figure could indicate a certain robustness about the battle. The figure indicates a wide range of casualty outcomes while still maintaining the historical result: the Union's successful defense of Little Round Top.

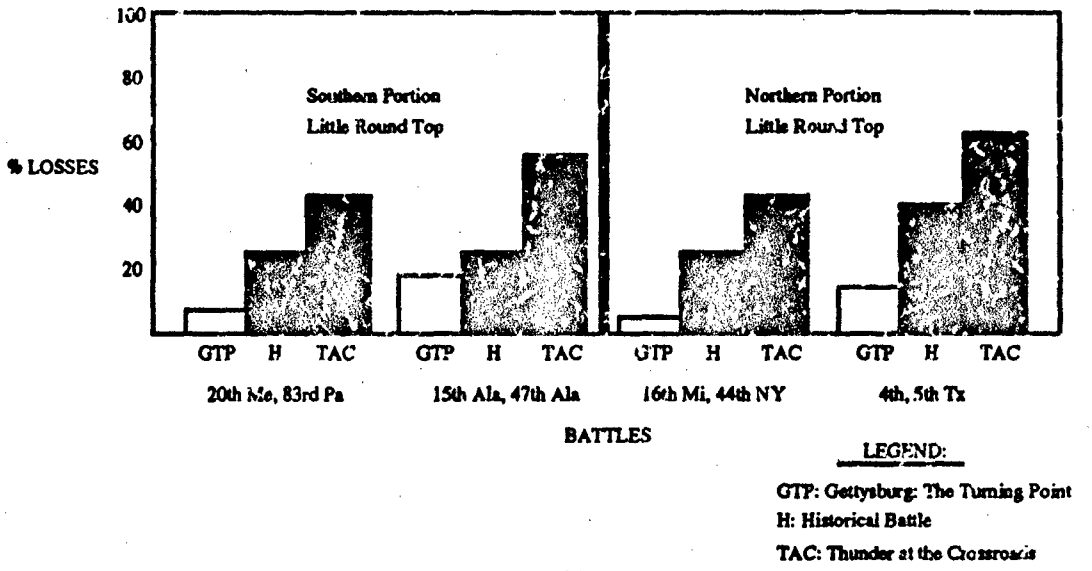


Figure 7.2. Comparison of Casualties Between the Historical Battle and the Wargames

7.3 What Changes are Required to the Models to Make Them More Representative of the Historical Combat

The challenge to any commercial wargame designer is to produce a game that is balanced between being historically accurate while at the same time being interesting and fun to play. The problem with increasing the level of detail to any model is that this usually results in an increased level of complexity and tends to slow the game down. The commercial wargame designer's ultimate goal is profit and the marketplace determines the balancing point.

One trend between the two wargames was the time in which the Confederate forces took to reach Vincent's brigade on Little Round Top. The time was exactly the same for all six scenarios played (1 1/2 hours), even though I used the quickest route to Little Round Top in each scenario. This is double the time the forces used during the actual battle. The results of the time to reach the objective indicates the need to allow units to move farther (modeling an increased rate) per game turn

when they are in an attack mode. Figure 7.3 shows the times to reach Little Round Top for the historical battle compared to the wargame scenarios. H hour indicates the time of the attack.

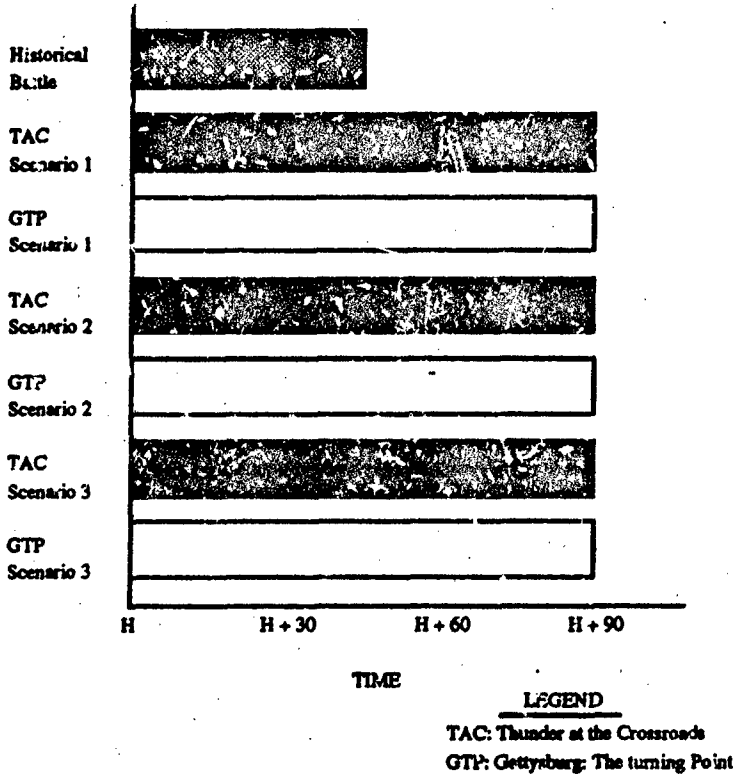


Figure 7.3. Time-lines to Reach Objective

One unique aspect of the research is to compare the strengths and weaknesses of the board versus the computer game. The board game, *Thunder at the Crossroads* has several strengths. First, the game has an excellent representation of the battlefield. The game has an intuitive appeal because players can look over the map with the counters and get a good picture of the current disposition of forces. Other strengths to the game include its wide range of possible outcomes, and the attempt to model command and control, morale and other intangible aspects of the battle. The strengths increase the realism of the game. On the other hand the game has

several weaknesses. First, the game is very complex and difficult to learn. The game is also very static. After all the pieces are set on the board, it is physically impossible to move the board around.

The computer game *Gettysburg: The Turning Point* also has several strengths and weaknesses. The strengths of the wargame include: its simplicity to play, its portability (all you need is a floppy disk), and there is always a ready made opponent (the computer). However, the screen display does not provide a very good feel for the overall disposition of forces. Also, the linear attrition process with its predictability of combat results produces only a limited range of outcomes. Finally, the game produces unrealistic events due to the NOFIRE equation used to model periods of limited visibility during the 5, 6, and 7 pm game turns.

7.4 How Do the Results Change with Varying Confederate Attacking Force Size

As one would expect, the greater the Confederate force size the closer the Confederates came to seizing Little Round Top. However, the major trend that develops during the three scenarios is that no matter what the Confederates did the Union always had a counter-punch. The Union had the ability to reinforce their lines unlike the Confederates. Another important theme is the timing of the events. In the historical battle, just when the Confederates were about to gain the advantage, the heroic efforts of the Union soldiers swung the battle back over in the Union's favor. The same held true during the wargames. If the model emphasizes anything, its the importance of the intangible soldierly qualities of initiative, selflessness, and perseverance.

7.5 Recommendations

The recommendations from this research effort are a result of two factors, the current lack of analytical research into the area of using commercial wargames as a tool for historical research and the limited scope of the study. The first recommen-

dation concerns the investigation and development of additional measures of effectiveness with which to judge the models. The measures used in this research were based on one individual's expertise and experience. Other measures need to be investigated which may shed additional insights into the use of commercial wargames as a tool for historical research. The second recommendation is to develop a computer program of the initial engagement between Law and Vincent to obtain a number of iterations of the battle. This process would provide the game's range of battle outcomes of the engagements. The third recommendation concerns the need to continue the investigation of other wargames that model the battle in greater detail. One wargame worthy of investigation is *Terrible Swift Sword*. *Terrible Swift Sword* models the movement and combat of forces at the regimental level.

7.6 Summary

This thesis provided the model analysis for two commercial wargames: *Gettysburg: The Turning Point* and *Thunder at the Crossroads*. Although some parts of the games are open to debate for the purpose of exploring the historical battle and playing "what if" type scenarios both served their purpose: to open one's imagination and develop insights. The results of the games must be judged on their insights into the battle, not as a precise prediction of what would happen. A model is not a crystal ball but a tool to use to gather insights. If each scenario was played over, the results could be different. Therefore, its not as important to find out what happened as much as it is to find out why it happened. Additionally, this research emphasized the need to analyze the wargame's structure prior to playing the game. This will avoid a possible mistake of drawing a conclusion about a particular driver in the battle which may not be from the historical situation but rather an inevitable outcome produced by the model's basic assumptions.

The investigation of the battle of Little Round Top using commercial wargames provided a unique opportunity to gain valuable insights towards my own professional

development. Throughout the study of the battle of Little Round Top and the combat models, my level of knowledge concerning the historical event and combat modeling continued to grow. The examination of the battle permitted an investigation into the principles and themes of warfare that impact on military leadership and tactics. The investigation of the commercial models highlighted their strengths and weakness and developed a greater understanding of the combat modeling process.

Bibliography

1. Attaway, L.D. "Criteria and the Measurement of Effectiveness," *Systems Analysis and Policy Planning: Applications in Defense.* Report Contract No. F44620-73-C-0011, Rand Corporation. New York: Elseveier Scientific Publishing Company, 1977.
2. Busey, John W. and David G. Martin. *Regimental Strengths and Losses at Gettysburg.* New Jersey: Longstreet House, 1986.
3. Center For Strategic Wargaming. *Gaming Support At The U.S. Army War College.* Pennsylvania: U.S. Army War College, 1991.
4. Chamberlain, General Joshua L. "Through Blood and Fire at Gettysburg," *The Gettysburg Magazine*, 6: 43–57 (January 1992).
5. Coddington, Edwin B. *The Gettysburg Campaign, a Study in Command.* New York: Charles Scribner and Sons, 1968.
6. Coggins, Jack. *Arms and Equipment of the Civil War.* North Carolina: Broadfoot Publishing Company, 1962.
7. Comptroller General of the U.S. *Advantages and Limitations of Computer Simulation in Decision Making.* Report series B-163074 Washington: Government Printing Office, 1973.
8. Donovan, Timothy H. and others. Class handouts distributed in Military Art, Department of History, United States Military Academy, West Point, NY, August 1981.
9. Dowdey, Clifford. *Death of a Nation.* New York: Alfred A. Knopf, 1958.
10. Downey, Fairfax. *The Guns At Gettysburg.* New York: David McKay Inc, 1958.
11. Dunnigan, James F. *The Complete Wargamers Handbook.* New York: William Morrow and Company, 1980.
12. Dupuy, Col T. N. "Can We Rely Upon Computer Simulations," *Armed Forces Journal International*, 999:58–63 (August 1987).
13. - - - - -. *Numbers, Predictions, and War.* Indianapolis: The Bobbs–Merrill Company Inc., 1979.
14. - - - - -. *Understanding War: History and Theory of Combat.* New York: Paragon 1987.
15. Essig, Dean N. "Civil War, Brigade Series Rules." Supplement to *Thunder at the Crossroads* Wargame by The Gamers, 1988.
16. Fernan, Capt Jude C. *Gettysburg: An Analysis of the Training Value of Commercial Models.* MS Thesis AFIT/GST/ENS/92M-02. School of Engineering, Air Force Institute of Technology (AU), Wright-Patterson AFB OH, March 1992.

17. Guderian, Heinz. *Panzer Leader.* New York,1952.

18. Gibney, John M. "A Shadow Passing: The Tragic Story of Norval Welch and the Sixteenth Michigan at Gettysburg and Beyond," *The Gettysburg Magazine*, 6: 33–42 (January 1992).

19. Hartman, James K. Class handout, OPER 775, Combat Modeling. School of Engineering, Air Force Institute of Technology. Wright-Patterson AFB OH, December 1992.

20. Havron, M. Dean and others. *Improved Artep Methods for Unit Evaluation, Volume V: Analysis of Alternate Training Settings*, 31 Jan 1978 - 30 April 1979. Contract DAHC1977C0001. McLean, VA: Human Sciences Research, Inc., April 1979 (AD-A075465).

21. Hofmann, Rudolf. *War Games.* Historical Division of the United States Army Europe, 1952.

22. Joint Chiefs of Staff. *Dictionary of Military and Associated Terms.* Washington: The Government Printing Office, 1987.

23. Kroegel, Chuck. "Game Rules: Gettysburg The Turning Point." Supplement to *Gettysburg The Turning Point* Wargame by Strategic Simulations, Inc., 1986.

24. Luvaas, Jay and Harold W. Nelson. *The U.S. Army War College Guide to the Battle of Gettysburg.* New York: Harper & Row 1987.

25. McPerson, James M. *Battle Cry of Freedom; The Civil War Era.* New York: Oxford University Press, 1988.

26. Norton, Oliver. *The Attack and Defense of Little Round Top.* New York: Neale Publishing Company, 1913.

27. Pfanz, Harry W. *Gettysburg — The Second Day.* North Carolina: The University of North Carolina Press, 1987.

28. Perla, Peter P. *The Art of Wargaming.* Maryland: Naval Institute Press, 1990.

29. Powell, David A. "Game Rules: Thunder at the Crossroads." Supplement to *Thunder at the Crossroads* Wargame by The Gamers, 1988.

30. Symonds, Graig L. *A Battlefield Atlas of the Civil War.* Maryland: The Nautical and Aviation Publishing Company of America, 1983.

31. Walters, Capt Eric M. "Studying Military History With Wargames," *Marine Corps Gazette*, 73: 41-44 (December 1989).

32. Wright, James R. "Time on Little Round Top," *The Gettysburg Magazine*, 2: 51–54 (January 1990).

Vita

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REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	March 1993	Master's Thesis

4. TITLE AND SUBTITLE
THE BATTLE OF LITTLE ROUND TOP: AN ANALYSIS OF BATTLE ALTERNATIVES THROUGH COMMERCIAL WARGAMES

5. FUNDING NUMBERS

6. AUTHOR(S)
John J. Mc Guiness

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
Air Force Institute of Technology, WPAFB OH 45433-6583

8. PERFORMING ORGANIZATION REPORT NUMBER
AFIT/GST/ENS/93M-09

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
U.S. Army War College
AWCAW Attn: Col Bradshaw, Bx 341
Carlisle Barracks, PA 17013

10. SPONSORING/MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION/AVAILABILITY STATEMENT
Distribution Unlimited

12b. DISTRIBUTION CODE

13. ABSTRACT (Maximum 200 words)

Abstract

This thesis examines the problem of whether one can use commercial wargames as a tool for historical research. The research examines two wargames dealing with the battle of Little Round Top: *Gettysburg: The Turning Point* and *Thunder at the Crossroads*. This research emphasized the need to analyze the wargame's structure prior to playing the game. This will avoid a possible mistake of drawing a conclusion about a particular driver in the battle which may not be from the historical situation but rather an inevitable outcome produced by the model's basic assumptions. Additionally, quantitative measures of time lines, casualty rates, and force ratios were examined during the replay of the historical battle and two other "what if" scenarios. Although some parts of the games are open to debate, for the purpose of exploring the historical battle and playing "what if" type scenarios both served their purpose: to open one's imagination and develop insights. The results of the games must be judged on their insights into the battle, not as a precise prediction of what would happen.

14. SUBJECT TERMS	15. NUMBER OF PAGES
Combat modeling, Wargames, Military history	194
	16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	UL